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Abstract

The doctoral dissertation examines university activity at sustainable economic development. The analysis of scientific literature reveals that the sustainable development of universities is mostly explored by scientific works at the macro level. The quality of higher education is another topic that is widely discussed by researchers. There is a lack of scientific works that examine the possibility for universities to strive for sustainable development at the institutional level. This dissertation addresses the need to create a model that would help universities to move towards sustainable economic development. The research object is the economic sustainability of the university. The aim of the dissertation is to create a model of university economic sustainability and to assess the impact of areas of the university activity on the economic sustainability of the university. The main objectives of the thesis are as follows: to analyse scientific literature on the practical implementation of the concept of sustainable development at universities; to examine the relationship between the quality management of university activities and the concepts of sustainable development from a theoretical perspective; to exemine the complexity of the university's economic sustainability by analyzing the university processes and the diversity of stakeholdres surrounding the university and to perform the economic substantiation of the complexity of the university's activities; to assess the relationship between the quality of the study process at the university and the concept of sustainable development to design the theoretical model for the comprehensive assessment of the study process at the university to make an economic validation of university's activities; to develop an algorithm for the comprehensive quality assessment system for the study process at the university with reference to theoretical simulation using the Analytical Hierarchy Process (AHP) method, and to verify the suitability of the comprehensive quality assessment model for the study process at the university regarding the examples of Lithuanian and foreign universities.

This dissertation is composed of an introduction, three chapters, general conclusions, a references list, a list of scientific publications, and appendices. The first chapter explores the scientific background in the field of the theoretical concept of university economic sustainability. The second chapter explains the comprehensiveness of university activities and composes the model of comprehensive assessment of the university-level higher education study process. The third chapter discusses the empirical research and findings at Lithuanian and foreign universities.

Five articles on the dissertation's subject were published: one in scientific journal included in the publications of the Clarivate Analytics database, three in a publications of other international databases, one in peer-reviewed international conference proceedings. The findings of the doctoral thesis were presented in two international scientific conferences.

Reziumė

Disertacijoje nagrinėjama universitetų veikla siekiant ekonominio tvarumo. Mokslinės literatūros analizė atskleidė, kad universitetų tvari plėtra yra gausiai nagrinėjama makro lygmenyje, taip pat aukštojo mokslo kokybė plačiai analizuojama įvairiais aspektais, tačiau pasigendama mokslo darbų, analizuojančių tvarios ekonominės universitetų veiklos galimybes instituciniame lygmenyje. Disertacijos problema ir aktualumas grindžiami poreikiu sukurti instrumentą, kuris padėtų universitetams siekti ekonominio tvarumo.

Tyrimo objektas – universiteto ekonominis tvarumas. Disertacijos tikslas – sukurti universiteto ekonominio tvarumo modelį ir įvertinti atskirų universiteto sričių įtaką universiteto ekonominiam tvarumui. Darbe sprendžiami šie uždaviniai: atlikti švietimo ekonomikos, žmogiškojo kapitalo, tvarios plėtros koncepcijos įgyvendinimo universitetuose praktikos mokslinės literatūros analizę bei išanalizuoti universitetų veiklos kokybės valdymo ir tvarios plėtros koncepcijų sąryšius teoriniu aspektu; atskleisti universiteto ekonominio tvarumo kompleksiškumą analizuojant universiteto veiklos procesus ir universitetą supančių socialinių partnerių įvairovę bei atlikti universiteto veiklos kompleksiškumo ekonominį pagrindimą; suformuoti universiteto ekonominio tvarumo modelį ir įvertinti jo atskirų veiklos sričių įtaką universiteto tvarumui; įvertinus ryšį tarp universiteto studijų proceso kokybės ir tvarios plėtros koncepcijos suformuoti universiteto studijų proceso kokybės kompleksinio vertinimo teorinį modelį; parengti universiteto studijų proceso kokybės kompleksinio vertinimo sistemos algoritmą paremtą teoriniu modeliavimu panaudojant daugiakriterinio vertinimo metodus ir jį aprobuoti Lietuvos ir užsienio universitetų pavyzdžiais.

Disertaciją sudaro įvadas, trys skyriai, bendrosios išvados, panaudotos literatūros sąrašas, autoriaus publikacijų disertacijos tema sąrašas ir priedai. Pirmajame skyriuje išanalizuoti moksliniai šaltiniai universitetų tvarios plėtros bei kokybės valdymo aukštajame moksle tematikose. Antrajame skyriuje atliktas universiteto veiklos kompleksiškumo vertinimas bei parengtas universiteto studijų proceso kokybės kompleksinio vertinimo sistemos modelis. Trečiame skyriuje atliekamas Lietuvos ir užsienio universitetų studijų proceso kokybės kompleksinis vertinimas panaudojant daugiakriterinio vertinimo metodą. Remiantis tyrimo rezultatais siūlomas rodiklių rinkinys padedantis kompleksiškai matuoti universiteto studijų proceso kokybę.

Disertacijos tema yra parengti penki moksliniai straipsniai: vienas straipsnis paskelbtas žurnale, įtrauktame į Clarivate Analytics (Web of Science) duomenų bazę, trys – paskelbti kitų, tarptautinių duomenų bazių moksliniuose leidiniuose, vienas – tarptautinės konferencijos pranešimų medžiagoje. Disertacijos tema perskaityti du pranešimai tarptautinėse mokslinėse konferencijose.

Notations

Symbols

$B_m^{(k)}$ – normalized decision-making matrix (see page 71);

D_m – areas (thematic groups) of study process (see page 67);

E_k – experts participated in research (see page 67);

I_j – criteria (sub-factors) of study process (see page 67);

$\lambda_{\max}^{(k)}$ – an eigenvalue of pairwise comparison matrix (see page 71);

$P_m^{(k)}$ – pairwise comparison matrice (see page 70);

S_A – random consistency index (see page 72);

$S_I^{(k)}$ – consistency index of P matrice (see page 72);

$S_m^{(k)}$ – degree of consistency (see page 72);

$\overline{q}_{m,i}$ – general wights (see page 74);

$q_m^{(k)}$ – eigenvector of $P_m^{(k)}$ (see page 71);

W_m – Kendall‘s coefficient of concordance (see page 73);

$\overline{\chi}_m^2$ – random variable which is distributed according to chi-square distribution (see page 73);

z_m – the consistencies of expert judgements (see page 73).

Abbreviations

3rd mission of university – A link of the university’s activities with its socio-economic context;

AACSB – The Association to Advance Collegiate Schools of Business;

AHP – Analytic Hierarhy Process;

AMBA – Association of Master of Business Administration;

B2B – Business to Business;

EFMD – European Foundation for Management Development;

EFQM – European Foundation for Quality Management;

EHEA – European Higher Education Area;

EQUIS – Quality Improvement System for Universities issued by EFMD;

ESG – Standards and Guidelines for Quality Assurance in the European Higher Education Area;

EU – European Union;

EUA – European University Association;

GDP – Gross Domestic Product;

MBNQA – Malcolm Badridge National Quality Award;

NGO – Non-Govermental Organization;

ISO – International Organization for Standardization;

QA – Quality Assurance

QMS – Quality Management System;

SD – Sutainable Development;

UNO – United Nations Organization;

USA – United States of America;

TQM – Total Quality Management;

ZET – Concept of Zero Emission.

Contents

[1] The annexes are supplied in the attached compact disc.

Introduction

Problem Formulation

Human capital theory, which was developed in the science of education economics, attaches special importance to the formation of contemporary society. Universities have a constantly changing position in the modern world due to technological development and penetration, the varying concept and role of knowledge, demographic and social changes in society, the provisions promoted by the European Higher Education Area for higher education institutions. Improvements to activities quality are needed for universities to develop their sustainable activity, which means remaining competitive and open to the current and future challenges.

Activities analysis of higher education institutions such as universities is a complex process due to the comprehensiveness of their activity, a wide diversity of stakeholders, different interests, societal expectations and unequal opportunities for the university in the social and political context determined by globalization. Given the scope of activities and its outcomes, the university must pursue a competitive advantage over other higher education institutions at the national and international levels. Thus, universities must strive for coherent development with reference to both internal and external sources if they are to maintain leadership in building society, advancing knowledge, promoting innovations, and forming human capital in the future.

Economic development is a long-term process of economic growth that manifests itself in the growth of quantitative economic indicators. Thus, the following question remains: "what should be measured in university activities in order to determine its economic development"?

Human capital theory was formed in the middle of the 20th century. This theory was complementary to economics and introduced the understanding of labour force formation problems closely linked to a rise in education expenses and an increase in the role of the state. Jacob Mincer, an American scientist of Polish origin, was one of the initiators of the theory of modern labour economics and empirically substantiated the theory of human capital. Mincer experimentally measured the impact of education and experience on salary levels. The value of J. Mincer's research is that education and knowledge today are considered to be the most important factors in economic growth.

Human capital theory has become a stimulus that has prompted detailed examination of information hidden under the letter *S* (Years of schooling), which stands for the function of the income of human capital created by Jacob Mincer.

Relevance of the Thesis

The dissertation reveals the importance of university activities for economical sustainability. Sustainable development is an ambiguous term in the scientific literature and is more frequently analysed at the macro or national levels, although the sustainable development of the organization is also possible. The ignorance of the institutional dimension is one of the most significant drawbacks of the implementation management of sustainable development (Čiegis, 2009).

This dissertation analyses the concept of education economics and human capital theory, discloses the comprehensiveness of the university as a type of organizational activities, the abundance and diversity of university-related stakeholders, and their relationship with the university. For that purpose, the classic quality management method has been used. The focus of the analysis has been shifted to higher education studies, which is one of the main processes of university activities. The process is analysed through the defined concept of the quality assurance of studies in the European Higher Education Area. This concept makes it possible to properly examine the links and importance of the components of the study process to ensure the activities and development of the university, leading to its economic sustainability.

The Object of Thesis

The object of research is the economic sustainability of the university.

Aim of the Thesis

Goal of the thesis is to design a university's model of economic sustainability that create pre-conditions to assess the impact of individual areas of the university on its economic sustainability.

Tasks of the Thesis

1. To analyse scientific literature on practical implementation of education economics, human capital theory, the concept of sustainable development in universities; theoretically examine the relationship between the quality management of university activities and the concept of sustainable development.
2. To identify the diversity of stakeholders surrounding the university in order to reveal the complexity of the university's economic sustainability, simultaneously creting pre-conditions for the analysis of processes of university's activities.
3. To design a model of economic sustainability of the university, while invoking scientific methods; identify the complex components of the university's economic sustainability and justify them.
4. To structure a theoretical model of the comprehensive evaluation of university study process, when evaluating the connection between the quality of university study process and the concept of sustainable development.
5. To develop an algorithm of comprehensive evaluation of university study process quality based on theoretical modelling, while using the multi-criteria assessment methods.
6. To conduct research of the comprehensive model for evaluation of the quality of university study process at Lithuanian and foreign universities and verify the effectiveness of the proposed model.

Research Methodology

The thesis applies scientific methods. To determine the boundaries of the investigated object and to search for the new aspects of the conducted research, scientific literature was analysed. This analysis covered the systematization of scientific concepts, meta-analysis, comparative analysis, interpretation, a comparison of terminology, and the formulation of hypotheses. The Cartesian product method was used to assess the complexity of the university's operating economy. Empirical research was carried out; the research combined methods for quantitative and qualitative analysis. The structured expert interview was used for the quantitative part of the research, whereas the multi-criteria assessment method (AHP) was employed for the qualitative part of the study. Lithuanian and foreign experts use the AHP method to make double comparisons of the criteria that defines the quality of the study process to determine their impact on the process. The following quality management methods are used for this thesis: cause-effect diagram, balanced scorecard system of indicators, and standards and guidelines of quality assurance in higher education.

Limitations of the Thesis

1. The scientific literature mainly discusses the concept of sustainable development at the national (macro) level, whereas this dissertation largely focuses on the organizational (micro) level, which has not been intensively studied in the scientific literature.
2. The comprehensiveness of the phenomenon of higher education assessed by the dissertation leads to the analysis of one of several possible types of higher education institutions, namely the process of core activities at the university. This process can otherwise be described as the higher education study process.

Scientific Novelty

The following results for the science of economic have been achieved in the course of preparing the PhD thesis:

1. The assessed economic sustainability of university has deepened and expanded the coherence between the concept of sustainable development and the quality of university activities.

2. A model of university economic sustainability has been developed. The importance of the quality criteria of the university study process on the development of the economic sustainability of the university has been determined. The research results form a basis for a set of institutional level (16) as well as departmental level (12) indicators for measuring the quality of the study process at the university.
3. The new theoretical model for the comprehensive assessment of the quality of the study process at the university has been created and empirically tested with reference to the examples of Lithuanian and foreign universities.
4. The economic theory of Human Capital has been deepened and developed by revealing the content and structure of knowledge and educational phenomena in the contemporary university.

Practical Value of the Research Findings

The theoretical model of the comprehensive quality assessment of the university study process creates preconditions for universities and other institutions of higher education to develop their study process. The model also enables effective pursuit of the strategic goals of the university. The university could better ensure the economic sustainability of its activities by focusing on the development of indicators that underpin the study process, their monitoring, and their adaptation to their mission.

The Defended Statements

1. Only universities that implement the economic principles of sustainability in their activities can ensure the harmonious and sustainable development of modern society. The institutional dimension and economic, social, and environmental parts must be considered as an equivalent elements of the concept of Sustainable Development.
2. One of the most important priorities in the pursuit of sustainable economic and social development is to base the activities of the university on quality management measures to make them effective. In this way, higher education (i.e., the university study process) become one of the most important university processes; its quality determines and influences the development of other key university processes (R&D and

innovation, the 3rd mission) that cover the interaction of different stakeholders.

3. Measuring university study quality assessment by purposefully selecting a multi–criteria assessment method can create a reliable tool for modelling and for measuring the quality of a particular university study process. The higher education process that is developed by these principles can contribute to the pursuit of the university's economic sustainability.

Approval of the Research Findings

Five scientific articles on the topic of the dissertation have been published: one was printed in the scientific journal included in the list of Clarivate Analytics (Web of Science) (Labanauskis et al. 2018). Three articles were issued in the peer-reviewed scientific journals in the international databases (Paliulis, Labanauskis 2015; Labanauskis, Ginevičius 2017; Labanauskis 2017), one paper – in the peer reviewed proceedings of international conference (Labanauskis, Kasparavičiūtė 2019). A reports on the topic of the PhD thesis were delivered in the international scientific conferences titled *Sustainable Organizations: Creating and Managing in Turbulent Business Environment* (10th Annual Scientific Baltic Business Management Conference, 2017, Riga, Latvia) and *Contemporary Issues in Business, Management and Economic Engineering* (CIBMEE-2019, 2019, Vilnius, Lithuania).

Structure of the Dissertation

This dissertation consists of the introduction, 3 chapters, general conclusions, references, list of author's publications, summary in Lithuanian and 4 annexes.

The volume of the dissertation covers 134 pages, excluding annexes, the text contains 24 numbered formulas, 19 figures and 18 tables. 184 references have been used for writing the dissertation.

1

Theoretical Analysis of the Concept of University Economic Sustainability

This chapter refers to scientific sources and aims to disclose the core of education economics, human capital theory, the sustainable development at university and tools that can help universities perform towards economic sustainability. The chapter consists of two sections the first of which analyses the theoretical assumptions of the concept of sustainable development and discusses how the concept of sustainable development is understood and implemented in higher education and specifically at universities. The second section of the chapter examines the concepts of quality management at universities. The chapter overviews the progress of quality dimension in Lithuanian higher education in the context of the Bologna Process for the last few decades. Quality management directions able to help universities with achieving sustainable economic development are identified analysing the diversity, role and effect of stakeholders on university activities thus demonstrating the intricacy of the environment surrounding the university. Sustainable development and quality management are analyzed as the elements of a single investigated construct in order to determine their interrelationship and the theoretical justification of their economic concept (structure).

The results of this chapter were published in two scientific articles: Paliulis, Labanauskis 2015; Labanauskis, Ginevičius 2017.

1.1. The Concepts of Education Economics and Human Capital Theory

The economic significance of education is determined by its role in the nation's economy. For a long time, economists did not properly assess the importance of the quality of the workforce. As the economy grows, education has increased and spending on education has increased. Its impact on the cost-effectiveness of production has increased. As education science ceased to be part of the general economic theory, there was a need to separate the education economy into a separate branch of science.

Education economics as a research area covers many dimensions. Separately can be explored costs and benefits, cost-effectiveness (economic effectiveness), equity (e.g. social). Deeper research such as labour market segmentation or education quality is also possible (Psacharopoulos, 1996b).

The middle of the 20th century formed a Human Capital Theory that was complementary to economics and introduced the understanding of labour force formation problems closely linked to a rise in education expenses and an increase in the role of the state. The American scientist of Polish origin Jacob Mincer was one of the initiators of the theory of modern labour economics and empirically substantiated the theory of human capital. The scientist experimentally measured the impact of education and experience on salary levels. The merit of J. Mincer is that education and knowledge today are considered to be the most important factors in economic growth. The method proposed by Mincer measures human capital through the function of the average of the school year (Mincer, J. 1958; Mincer, J. 1974) (Patrinos, 2016):

$$H = e^{p(s)}, \tag{1.1}$$

where s is the average of the school year, p is the rate of return on investment and the e – efficiency index. This work attempts to reveal what is hiding under the letter s in the Mincer formula. It is possible to express a certain quality of studies in a quantifiable way, as studying i.e. learning (understood in this work as university studies of higher education) is carried out in very differently performing universities (Psacharopoulos, 1996a).

The works by one of the human capital theorists Theodore Schultz *"The Economic Value of Education"* (1963) and *Investment in Human Capital: The Role of Education and of Research* (1971) has laid the foundations of the Education

Economics. The human capital theory states that investing in people is the decisive factor in guaranteeing human wellbeing. The funds invested in human capital give a higher GDP growth than the funds invested in corcapital.

The human capital theory is to be considered as a new concept of modern economics, dealing with labour force formation and quality problems (Bagdonavičius, 2002). Theory reflects qualitatively new labour force formation issues closely related to increasing spending on education and increasing the role of the state in labour force formation processes.

The human capital theory is widely used to justify investment in secondary and higher education. Surprisingly we still can find some countries providing higher education for "free of charge" (without tuition fees) especially for the home students, but economics dictionaries do not recognize terms as "free of charge". Unlike secondary education, higher education is not compulsory in any country in a world. Moreover, higher education is not a public good (Kuodis, 2010). However, higher education is one of the branches of the economy that provides meaningful service.

The Table 1.1 provides the different theoretical concepts in scientific literature in a field of Education Economics and Human Capital theory.

Profit Rate Indicator occupies a central position in Human Capital theory. It makes it possible to compare the return on investment in human and physical capital. Over the 60-plus year history of returns to investment in education estimates (from 1950 to 2014), private returns to higher education increased, raising issues of financing and equity (Psacharopoulos & Patrinos, 2018).

Investments in higher education by individuals are fully profitable and bring significant benefits. The payback ratio (personal rate of return) for private investment in education ranges from 11.8% to 13.4% for a bachelor's degree, 8% for a one-year postgraduate level, and 7.2% for a master's degree and doctoral level (PhD) – 6.6 percent (Heller, 1997).

The economic efficiency of higher education remains reasonably high and tends to grow. It is noted the contribution of higher education to economic growth; the significant influence of higher education institutions, especially universities, on the economic situation of the regions. The social profit rate of higher education is also high. Public expenditure on higher education pays off more than was expected.

Overall, higher education has a significant impact on the redistribution of income between rich and poor (Doppelt, 2019). Tuition fees another crucial area. Changes in higher education costs affect student admission rates and enrolments. Increasing tuition fees leads to a decline in enrolment, to which students respond negatively enough (Beneito, Boscá, & Ferri, 2018).

The existing student support system (scholarships, loans, discounts) expands the possibilities for young people to acquire higher education from various backgrounds and to choose the type of institution.

Table 1.1. Scientific literature and main concepts in the field of Education Economics (compiled by author)

Main topics in Education Economics	Key Authors and Papers
Financing models and public spending on higher education	(Psacharopoulos, 1996a); (Psacharopoulos, 1996b); (Greenaway & Haynes, 2003); (Boarini, Martins, Strauss, de la Maisonneuve, & Nicoletti, 2008); (Želvys, 2009); (Longlong, Fengliang, & Weifang, 2009); (Del Rey & Racionero, 2010); (Babravičius & Dzemyda, 2012); (Lung(Moladovan), IoanMoldovan, & Alexandra, 2012); (Želvys, 2013); (Olivares & Wetzely, 2014); (Erina & Erins, 2015); (Erkoç, 2016); (Diris & Ooghe, 2018)
Economic growth and impact on labour market	(Curea & Ciora, 2013); (Šipilova, 2014); (Cheek, Santos, & Vaillant, 2015); (Dumciuviene, 2015); (Giziene & Simanaviciene, 2015); (Holmes & Mayhew, 2016); (Doppelt, 2019)
Returns on Investments (ROI)	(Mott & Granata, 2006); (Boarini et al., 2008); (Patrinos, 2016); (Psacharopoulos & Patrinos, 2018); (McMahon, 2018);
Employment status and earnings	(Brown & Sessions, 1999); (Polachek, 2008); (Walker, Vignolesy, & Collins, 2009); (Kozioł, Kozioł, Wojtowicz, & Pyrek, 2014); (Arteaga, 2018);
Signalling value of the diploma	(Hussey, 2012); (Cunha & Miller, 2014)
Tuition fees	(Neill, 2009); (Hübner, 2012); (Dwenger, Storck, & Wrohlich, 2012); (Beneito et al., 2018);
Student loans and student aids	(Del Rey & Racionero, 2010); (Tangkitvanich & Manasboonphempool, 2010); (Chapman, Lounkaew, Polsiri, Sarachitti, & Sitthipongpanich, 2010); (Rothstein & Rouse, 2011); (Booij, Leuven, & Oosterbeek, 2012); (Migali, 2012); (Dearden, Fitzsimons, & Wyness, 2014); (Naidoo & McKay, 2018); (Dearden, 2018); (Long, 2018); (Britton, van der Erve, & Higgins, 2018); (Armstrong, Dearden, Kobayashi, & Nagase, 2018); (Barr, Chapman, Dearden, & Dynarski, 2018)

Here, loans for the students could be analysed as a separate sub-section. The majority of research works comes out about two decades ago.

According to Nicholas Barr (2018) the university funding in most countries are regressive, from gross tax incomes. It means that benefits come mainly to children from middle class and elite. For this N. Barr suggests using income-contingent (i.e. income-linked loans) after Great Britain example:

- Students take loans to pay for their tuition fees and living expenses and repay them upon graduation.
- The payment while repaying would be x percent of income. It would be like a kind of additional income tax of several percent.
- It is administered through the income tax system.

As for the *Pros,* such loan system also becomes an insurance system – if you have no income, you do not have to repay a loan. In other words, the *pay-as-you-go* principle is applied: if you have a low income, your loan repayment will also be low. For such state-supported (or guaranteed) loan system, there are no deposit issues – the future income of the student itself is a deposit.

As for the *Cons,* the lack of financial knowledge and fear of uncertainty in the future are seen as main aspects of criticism for such a system. Graduation itself does not guarantee a bright career path and research work confirms of diploma signalling value.

This review of concepts of Education Economics and Human Capital Theory substantiates the meaning and relevance of these topics to contemporary economic processes. Moreover, intellectual capital, as the driving force of the modern economy, is seen as the result of a combination of human capital and structural capital to create and nurture the value of organizations.

1.2. Theoretical Assumptions of the Concept of Sustainable Development

Universities are one of the oldest types of organizations in action. Improvements to activities quality are needed for universities to develop their sustainable and harmonious activity, which means remaining competitive and open to the current and future challenges.

Exceptional and sustainable activities can create preconditions for the highest-level scientific activity and for the efficient use of research results in the study process. Exceptional research can increase a higher education institution's attractiveness to a business sector that is seeking innovations and new solutions. The outstanding quality of studies can guarantee graduate competences required for the labour market and greater attraction to students. The regularly developed

3rd mission of universities manifests itself in the use of scientific knowledge created in the university in a non-academic environment. The economic benefits of generating profits and the societal benefits of knowledge can assist in the maximum harmonization of the expectations of different social stakeholders and contribute to shaping the image and role of the university and to promoting the development of society.

The concept of sustainable development was introduced and became popular in the second half of the 20th century when societies began realizing that economic growth and technological development faced their black side-the polluted environment, the depletion of natural resources and consequences for humanity.

In 1987, the World Commission on Environment and Development published a report entitled *Our Common Future* (Brundtland, 1987) defining sustainable development as "growth meeting the current societal needs with no reduction in the ability of future generations to satisfy individual requirements". This definition laid a foundation of framing the concept of sustainable development. This report is important for emphasizing economic and social dimensions beside the prevailing dimension of environmental sustainable development. The document highlights the role of the market mechanism in development processes, draws attention to the role of poverty and human overpopulation in the depletion of natural resources and focuses on the quality of life considering present and future generations. This document provided a basis for the formation of the strategic approach to sustainable development (Siva, Gremyr, Bergquist, Garvare, Zobel, & Isaksson, 2016).

The 1992 World Summit in Rio de Janeiro preferred the idea of sustainable development as the main ideology of long-term social development. The declaration adopted during the summit formed a basis for the formulation of the concept of sustainable development, which further has led to the spread of the ideas of sustainable development worldwide. In the coming decades, the concept of sustainable development has become a vital element in the growth and implementation of national strategies for sustainable development.

The ideas of sustainable development have been actively declared and promoted by global organizations, including the United Nations Organization, World Bank, the European Union, etc. In order to implement these ideas, international conferences are held and strategies are devoted to such areas as education, higher education, social development (Calder & Clugston, 2003; Wright, 2004; Lozano, Lukman, Lozano, Huisingh, & Lambrechts, 2013).

In 2015, the United Nations General Assembly prepared a plan for sustainable development entitled Transforming our World: The 2030 Agenda for Sustainable Development. The plan contained 17 global goals working towards such areas of life as poverty, zero hunger, good health and well–being for people, quality

education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reducing inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice and strong institutions, partnerships for the goals.

Scientific literature most frequently analyses the following dimensions of sustainable development:

- Ecological – biodiversity, natural resources, pollution.
- Social – poverty, counselling (power of attorney), culture (heritage).
- Economical – efficiency, growth, stability.

It should be noted that all these dimensions are closely interrelated. The authors examine them both integrally and individually focusing on one particular dimension. Diversity of attitudes reveals the broadness of the concept of sustainable development (Čiegis & Zeleniūtė, 2008).

The concept of sustainable development has been thoroughly analyzed in the research papers of foreign and Lithuanian scientists. A large number of doctoral dissertations on this concept have been defended in Lithuanian (Klimavičienė 2011; Gižienė 2011; Kareiviatė 2012; Činčikaitė 2013; Lapinskaitė 2013; Medineckiene 2014; Lazauskas 2015; Levickaite 2015) and foreign universities.

Despite the fact that the concept of sustainable development is not a new phenomenon in the spaces of politics, science and society, its dissemination is burdened by the intricacy of the content, the peculiarities of terminology and even translation. It is therefore appropriate to start work from the operationalization of the key concepts.

An important point is an ongoing informal discussion among Lithuanian scientists about "harmonious development" and "sustainable development" while English terminology refers to the same term of *"sustainable development"*. In 2003, the State Commission of the Lithuanian Language pointed out the distinction between harmony and sustainability in the following way: *"harmonious"* was accepted to be more appropriate for underlining balanced development, whereas *"sustainable"* was more likely to be a durable and uninterrupted process. In view of the object of the research paper and taking into account the interpretation of the concept proposed by the State Commission of the Lithuanian Language, the term *"sustainable development"* has been preferred to be applied in this work.

The papers of researchers at the macro (international, national) level measure sustainable development using a variety of aggregate indices such as the Index of Sustainable Economic Welfare (ISEW), the Genuine Progress Indicator (GPI), the Sustainable National Income (SNI), Green Net National Product (EDP) for measuring gross domestic product, the Well–Being Index (WI) and the UN Human Development Index (HDI) for measuring human development, the Environmental

Sustainability Index (ESI) for environmental preservation, the Environmental Vulnerability Index (EVI), the Environmental Performance Index (EPI), the Ecological Footprint (EF), the Living Planet Index for biodiversity (LPI), the City Development Index (CDI).

These indices are made up of the compositions of various indicators. For example, the Index of Sustainable Economic Welfare (ISEW) consists of 21 variables 14 of which are economic. The index measures national economic growth and often changes gross domestic product (GDP), which is another known economic indicator. The GPI encompasses everything that constitutes GDP and expands it by additional elements reflecting negative consequences such as income inequality, the cost of crime, environmental damage, etc. arising from economic activities. The index combines the positive and negative results of economic growth. The GPI index was created on the basis of the theory of "green economy". Index proponents treat the index as a better unit of measurement for assessing economic sustainability compared to GDP.

The countries all over the world are developing national strategies for achieving the goals of sustainable development. All European countries have designed national strategies for sustainable development, which provides both the horizontal and vertical integration of performance supplemented by the surveillance, assessment or monitoring (indicator sets) tools (see Table 1.2).

Table 1.2. The examples of strategies for national sustainable development (comiled by the author according to the data obtained from the European Sustainable Development Network, 2017)

Estonia	The National Strategy for Sustainable Development was adopted in 2005. The strategy covers three dimensions of sustainable development and the sustainability of Estonian culture.
Latvia	The Strategy for Sustainable Development was approved in 2010. The strategy has become a key strategic planning document (up to 2030) and includes long-term priorities, relevant targets and policies. National Medium Term Development Plan for the period 2014–2020 and the documents of planning individual sectors complement the implementation of the Strategy.
Lithuania	The National Strategy for Sustainable Development was approved in 2003 and 2009. The strategy was updated in 2011 and referred to the specified institutions responsible for achieving the goals of the strategy. A list of indicators for measuring sustainable development has been prepared the values of which are collected and published by the Department of Statistics of the Republic of Lithuania.

In economics, sustainable development is accepted as a sort of development ensuring that per capita income of the future generations should not be lower than that of the current generations. Sustainable development can also be understood as a process of and changes in economic development that help to increase human potential. Sustainability can be achieved by stabilizing a quantitative growth in the output replacing it with qualitative economic development. In this case, sustainable development in economic activities can be also assumed as development with no growth.

The carried out analysis of the concepts of sustainable development has demonstrated that all the elements of the concept are most frequently examined integrally. However, the analysis of scientific literature reveals the fourth – institutional – dimension in the concept of sustainable development. The World Development Report 2003, Chapter 3, states that sustainable development depends on institutions and human behaviour is determined by social norms and rules.

This makes it possible to assume that the human-made decisions and simulated processes of actions are decisive factors in the institutions (organizations, enterprises) working towards qualitative changes in the development of society.

Due to the clearly defined goals, it seems to be an easy task to explain an aspiration of the institutes (international organizations, states) acting at the global or macro-level for the principles of sustainable development. Focusing on the micro level at individual institutions, organizations or companies, the question *why it is generally appropriate for the organization to pursue sustainable development* becomes relevant. The concept of sustainable development is often used for analysing the growth of a country or region, but only a set of organizations that are mature enough may succeed in achieving this goal. In order to achieve their primary objective – profit – such organizations should be socially and ecologically focused (Šimanskienė & Paužuolienė, 2011). Such organizations must understand the importance of learning, advancement and exchange, i.e. a certain level of the maturity of the organization should be achieved, otherwise, no further discussion on the issue of sustainable development is possible. The arguments formulated by organizations for implementing sustainability strategies are also divided into environmental, economic and social. By implementing sustainability strategies, companies can link their long-term profitability with efforts to protect the ecosystem taking advantage of the possibilities of traditional competitive benefits such as pricing and market segmentation (Stead & Stead, 1995). When shifting the focus from the aspect of environmental sustainability to the economic one, it should be noted that a sustainable economic system will be considered the one operating in a way that generates higher or at least equal income. This economic principle also applies to an individual organization or company.

Sustainable development for a business enterprise means working out a business strategy and the way of action that should satisfy the present needs of the enterprise and respond to the requirements specified by stakeholders while protecting, nurturing and strengthening human and natural resources that will be necessary in the future (Business Strategy for Sustainable Development: Leadership and Accountability in the 1990s, Canada, 1992). The dependence of the business enterprise on human and natural resources as well as physical and financial capital is emphasised.

At this point, it is expedient to discuss the key features of the sustainable organization (company) identified in scientific literature.

In most countries, sustainable social and economic development is subject to effectively operating local organizations, horizontal and vertical links between individual sectors. In this medium, the so-called "merging organizations" have emerged and been established between the paradigms of "market management" and "state governance". This type of organizations includes associations, networks, inter-sector partnerships and public movements. The nature of their performance is shaped by values and visions, carried out tasks, a diversity of members and external threats, but the ability to work with different or separate domains stands out as one of the exceptional abilities (Brown, 1991).

The vision of sustainable companies and societies is revealed by the concept of zero emission (ZET) combining ecological and economic goals. The idea of the concept has been borrowed from the zero error principle formulated by Ph. Crosby and served for effective quality management when all defects that may occur during the production process are in need of being systematically eliminated. For implementing zero emission technologies, the role of the organizational culture based on the vision of sustainability, a reduction in organizational intricacy and further development is emphasized (Baumgartner & Zielowski, 2007).

Emphasis is placed on the impact of human resource management developing the sustainable organization. It is believed that the relationship between these dimensions involves several important management aspects such as innovations, cultural diversity and the acting environment, and human resource management is seen as the key link (Jabbour & Santos, 2008). To put forward the idea, it is worth mentioning qualitative research carried out by the well-known US furniture manufacturer Herman Miller. The study demonstrated the importance of the values and culture promoted by the enterprise and the empowerment of its employees based on the principles of shared leadership in order for the company to achieve sustainable development (Manz, Manz, Adams, & Shipper, 2011).

The preconditions for sustainable corporate development have been analyzed by combining strategies for the culture of the organization and corporate sustainability with the aim to answer the question if the concept of sustainable development can become a catalyst for the processes of organizational changes and how

to develop the culture of the organization in this direction. The levels of organizational culture highlighted by Schein – artefacts (structures, processes), values (strategies, goals, philosophy), underlying assumptions or conditions (attitudes, contemplation, emotions) and corporate sustainability strategies (introvert, extrovert, conservative, visionary) were linked in search of answers. The idea that a corporation striving to be more sustainable requires understanding its organizational culture and combining corporate sustainability performance has been promoted (Baumgartner, 2009).

In search of new management solutions for implementing the concept of sustainable development at the level of the organisation, standardization systems developed by the International Organization for Standardization have been proposed. A set of three integrated systems covering quality management, environmental management, occupational health and safety management has been suggested. At the level of the organization, quality management systems comply with the ISO 9001 standard for the economic objectives of the concept of sustainable development, the environmental management system meet with the ISO 14001 standard for environmental protection objectives, occupational health and safety management go along with the OHAS 18001 for social objectives (Ejdys & Matuszak-Flejszman, 2010).

The other study explores how the outlook of interaction and networking can accelerate organizational learning and stimulate changes determining sustainable development. Changes lead the organization towards sustainability through interoperability and networking featured in collaboration and transformation. The main impetus for the organization to rely on the importance of interaction and networking for introduced changes points out the fact that actions take place interacting with other organizations, customers and government agencies rather than in the isolated environment. Therefore, emphasis is placed on the importance of organizational learning (as a result of a dialogue and interaction) that should be included in all levels of system development thus identifying specific organizational capabilities necessary at individual levels to achieve sustainable changes (Ryan, Kajzer Mitchell, & Daskou, 2012).

It is noteworthy that a separate organization on its own will fail to achieve sustainable development, and therefore the ability of the organisation to work with social partners is also considered to be a mandatory condition for seeking sustainability (van Marrewijk & Werre, 2003).

Scientists and entrepreneurs agree that sustainable development provides a long-term course of steady activities for a company. Such companies and organizations have a clearer understanding of business and personal outlooks, do not suffer for the frequent leakage of minds and knowledge, employees feel safer and sudden negative changes are less likely to occur. At the macro level, sustainable

development can be understood as knowledge of the policy the company and state follow together rather than one by one.

To sum up the attributes of the sustainable organization or company, it is possible to distinguish such key elements as effort and ability to manage changes, organizational culture, the ability to learn at the level of the organization and the interaction with social stakeholders and environment surrounding the company.

The other chapters of the thesis treat the university as a certain type of the institution (organization) that can be distinguished by its peculiarities from other organizations. The dissertation will further focus on finding methods and instruments for the university to achieve sustainable economic development.

1.2.1. The Assessment of Sustainable Development at Universities

This sub-section of Chapter 1 reviews the ideas of sustainable development understood in the context of higher education and implemented in higher education institutions, specifically at universities. The dissertation treats the university as a certain type of the organization notable for its uniqueness and peculiarities from other organizations. Selecting this particular object of analysis has been determined by several reasons.

Universities can be reasonably considered one of the longest-running types of organizations. Yet in the Middle Ages, monastic schools in Europe were the start of the emerging universities that received the recognition of secular authority and a permission for self-government. From the Middle Ages to the beginning of the 19th century, European universities were like 'ivory towers' where intellectuals created and spread science often separated from practical daily needs (Garcia–Aracil & Palomares–Montero, 2010). Nowadays, other organizational structures, such as the universities of applied sciences, other higher education establishments, colleges, research institutes, etc. act as higher education providers and contributors. The latter are most frequently related to one area or activities of higher education – usually to specific studies or research in a particular field of science.

At the macro level, sustainable development can be analyzed through its relationship with higher education as a system in general. The possible formulation of the problem is finding techniques for developing higher education as a system in a sustainable way. Thus, the higher education institution should become the key player in modernizing and transforming higher education. In this case, establishing national and regional goals, networking higher education institutions, the development and application of different policy tools for students, teaching staff and higher education establishments are possible. The carried out research taking this direction should primarily focus on the vision of the higher education system and

the goals and means to implement rather than on the higher education institution itself.

Meanwhile, at the micro-analysis level, universities are regarded as a certain type of the organization that is specific and operating in a particular environment. At the same time, universities are seen as the core part of the higher education ecosystem encompassing and connecting all three elements of the system:

- All forms of higher education studies.
- Scientific research, application of the obtained results, innovations.
- The 3rd mission of universities, including public prestige, the status of graduates, impact on the region and contribution to the development of the state (region or even the world).

At the micro level, the organization finds important an aspiration and ability to change and transform under operating conditions of constant changes and under the influence of social stakeholders thus seeking new forms of activities and anticipating what knowledge, skills and qualifications will be required for future society creators and top-level labour market professionals.

Potential directions for the analysis of the sustainable development of higher education at the macro and micro levels are depicted in Figure 1.1.

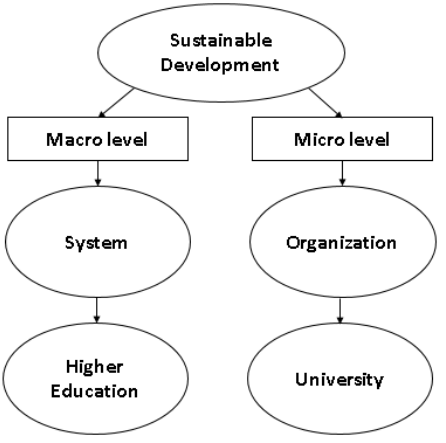

Fig. 1.1. The prospects of the analysis of sustainable development (compiled by author)

Researchers widely analyse the concept of sustainable development in the sector of higher education. Universities carry out three major missions: training, research and public services. These missions have always struggled with each other (Altbach, Reisberg, & Rumbley, 2009). It is equally important that environmental conditions have faced different types of activities and changed rapidly over

the recent decades. At the national and international level, competition between universities increases and frantic search for uniqueness and exclusivity takes place. Thus, the harmonization of the current activities (short-term goals) and the pursuit of the sustainable development of the organization (long-term goals) are becoming more and more intricate. Also, attention should be drawn to the fact that universities differ from the other types of organizations by being attributed to the roles of future leaders, decision-makers and trained intellectuals (Amaral, Martins, & Gouveia, 2015).

In various countries and cultures, the concept of sustainability differs from one point to another with a different degree of expansion and is based on different sets of norms and values. An important issue that faces universities as intricate and unique organizations is learning as well as obstacles and impetus arising from external influences. The implementation of the idea of sustainable development in higher education institutions is often accepted as the process that can be planned and managed "from the top" with solid support from the "bottom" and management assistance as a prerequisite (Barth, 2013); however, it can be added that changes are not completely a choice of the universities themselves, as it is a necessity determined by external imperatives such as variations in the demographic situation of students or participation patterns (Shah & Sid Nair, 2014).

Scientific literature defines a sustainable university on the basis of environmental, economic and social aspects that should be taken into account by the university considering daily activities and committing itself to being an example to pursue (Amaral, Martins, & Gouveia, 2015). The dimensions of sustainability are as follows: (1) students act as agents replacing informal teaching with the formal one; otherwise, it is a social learning process with deep reflection at the individual (personal) level; (2) sustainability as the basis for arranging university infrastructure, which is to bring about changes in activities developing energy saving campaigns, the use of natural and renewable resources, the promotion of ecological transport or food waste reduction programs; (3) sustainability as a unique aspect of exclusivity, otherwise, brand recognition and consolidation (Barth, 2013).

Universities often accept sustainability as an opportunity to base education on problem analysis and various case studies thus providing them with the interdisciplinary and applicable nature; however, some studies disapprove such approach and criticize case studies as a research method for examining sustainability in higher education (Corcoran, Walker, Wals, & Walker *, 2004).

Another important factor is the integration of the concept of sustainable development into the curricula and study programmes of the higher education institution combining knowledge transfer, learning about changes that forms the concept of the green university and the learning model "education as sustainability". Academicians are expected to have a "deep and comprehensive understanding of

sustainability allowing the idea to spread across different course units from different perspectives. However, the most important element in creating a culture of sustainability is the existence of a political will at the university, which allows for the pursuit of long-term goals (Bardaglio, 2007). Other authors analyse the procedures needed for changes in higher education. The conducted analysis may include the processes of how sustainability is integrated into teaching, research and daily activities by various higher education institutions awarding different degrees and taking into account the most active social partners. In this context, the processes and factors involved in the impetus or interference function and their interaction are examined (Barth, 2013).

Individual studies focus on the importance of training the academic staff and similar programmes. For example, the implementation of the project and examination of changes at a technical university in Ecuador demonstrated that learning in order to achieve sustainable development provided the opportunity to present new and innovative ways of teaching and learning. Such training of the academic staff affects the competences of the employees and promotes the social development of the whole organization. In other words, employee training creates "opportunity windows" for changes in the organization (Barth & Rieckmann, 2012).

Also, research on how students accepted the inclusion of sustainable development ideas in the curriculum of higher education studies were carried out. The core of the concept of "higher education for sustainable development" is the promotion of the broad-mindedness and cosmopolitan interest of young people in the studies of interdisciplinary sustainability thus complementing their main field of study. This idea is mainly aimed at developing student transformational competences (Barth & Timm, 2011).

The analysis of the articles published in the scientific journal *Sustainability in Higher Education* in 2001–2010 reveals that, over this period, most of scientific publications concentrated on the areas such as environmental management, "green" universities and a reduction in the ecological impact (footprint) at the university (Wals, 2014), "green" buildings, the sustainable infrastructure of the campus and the implementation of environmental management tools such as environmental management and auditing, ISO 14001 standard.

In order to better systematize research on university activities of sustainable development and to answer the question *what sustainable development means for the university*, research articles published in one of the most prestigious scientific production database Clarative Analytics (Thompson Reuters Web of Science) for the last decade have been examined. The analysis demonstrated a wide range of the components of this topic: the involvement of social stakeholders in university activities, "green" campus factors that allow protecting natural resources, the go-ahead analysis and self-assessment of implementing sustainable development, the aspects of curriculum renewal and organizational changes in management.

The analysis of these scientific sources was carried out in 2017–2018. The following combinations of search criteria were applied: [(sustainable development) and (universities)], [(sustainable universities)] and [(sustainable organizations)]. For the conducted analysis, a period of the last decade, i.e. 2006 to 2018, was chosen. Based on article summaries and keywords, 59 scientific papers were selected for detailed review. The preferred articles featured such keywords and their combinations as: "universities", "higher education institutions", "sustainable universities", "sustainable development", "sustainability model", "organizational sustainability", "sustainable management", "integration of sustainable development", "green universities", "institutional transformation", "corporate sustainability", "education for sustainable development", "sustainability assessment and reporting", "implementation of sustainable development", "management of organizational changes".

The analyzed articles cover three main topics:

- Management (Strategic) tools for university development and change management.
- Transition from the concept of "green" universities and a reduction in the environmental impact to the development of organizational capacities at universities.
- The curriculum and study programmes for the sustainable development of the university.

Table 1.3 shows the main features of the listed topics studied by the scientists who have analysed the implementation of the concept of sustainable development at universities.

To sum up the topics outlined in Table 1.3 sustainable development can be seen as an appropriate tool for underpinning the strategic management of the university. There are a number of produced models for developing the vision, mission and strategic goals of the university. The models are based on the proposed sets of indicators for measuring university activities, because most frequently the standards of continuous improvement in activities and quality management are based on monitoring continuous progress. Universities make efforts to introduce sustainable management into ongoing activities, because a part of the carried out research points to the prevailing resistance of the community to changes.

The successful implementation of sustainable strategies for introducing changes is more likely when "top-to-down" requirements and "bottom-up" expectations and attitudes intertwine and fulfil each other (Lu & Zhang 2013). As for the modern management paradigm, the functions of the administrative

structures of universities change from process control to result control. The assessment of the quality of higher education is becoming the key element of result management.

Table 1.3. The analysis of scientific literature on the sustainable development of universities (compiled by the author)

Topic	Main features	Authors
Topic 1 Management tools for university development and change management	Sustainable universities; Arrangement of infrastructure performance; Strategic management of the university; Processes; Brand; Students as agents for changes at the university; Student attitude towards sustainable development.	Velazquez, Munguia, Platt, & Taddei, 2006; Lukman & Glavič, 2007; Beringer & Adomßent, 2008; Ferrer–Balas, Buckland, & de Mingo, 2009; Holm, Sammalisto, & Vuorisalo, 2015; Amaral, Martins, & Gouveia, 2015; Verhulst & Lambrechts, 2015; Cebrián, Grace, & Humphris, 2015; Dentoni & Bitzer, 2015; Katiliute & Daunoriene, 2015; Barnard & Van der Merwe, 2016.
Topic 2 From "green" universities and a reduction in the environmental impact to the development of organizational capacities at universities	Environmental management; Reduction in the environmental impact.	Agamuthu & Hansen, 2007; Wright & Wilton, 2012; dos Santos Martins, Correia Loureiro, & Castro Amorim, 2012; Saleh, Mohammed, & Abdullah, 2015; Ramos, Caeiro, van Hoof, Lozano, Huisingh & Ceulemans, 2015; Disterheft, Caeiro, Azeiteiro, & Filho, 2015; Vagnoni & Cavicchi, 2015; Ngo & Trinh, 2016; Sonetti, Lombardi, & Chelleri, 2016.
Topic 3 The curriculum and study programmes for the sustainable development of the university	Studies and research methods; Interdisciplinarity; Learning outcomes.	Niu, Jiang, & Li, 2010; Lu & Zhang, 2013; Barthes, Alpe, & Bader, 2013; Kitamura & Hoshii, 2014; Dumitrascu & Ciudin, 2015; Lozano, Ceulemans, & Scarff Seatter, 2015.

The major boost is observed in the shift from the simplified awareness of "green" universities and a reduction in the environmental impact covering waste

management, recycling and the conservation of natural resources towards university efforts to implement these principles in the conducted study programmes, curriculum content and teaching methods.

The curriculum and study programmes of sustainable development are offered by universities and highlight the need for interdisciplinarity, experimentation and student involvement in project activities. The main challenge of sustainable development in the fields of study programmes and teaching content is a desire for training the young generation to make them active players involved in the changing society.

To sum up this sub-section, it can be maintained that the pursuit of sustainable development at the university is primarily the management of changes in the organization and the learning process, which, in each of the cases, is different with regard to the methods and a degree of the need for support (acceptance). Thus, the question on how to qualitatively and effectively manage changes at universities in order to achieve sustainable economic development arises. It is assumed that quality management methods can be used for managing changes, and therefore, in this case, it is appropriate to discuss quality management dimension in university activities.

1.2.2. Factors Affecting the Universities Activities for Sustainable Economic Development

Factors affecting the universities activities for sustainable economic development are determined by the complexity of university activities. Following the analysis of scientific sources on sustainable development of universities several approaches needs to be revealed in a details. The sustainable university management comes as first and most important element which seen as process modelling the quality of life for the range of surrounding stakeholders and society in general. Sustainable university management encompass such factors as organizational structure, strategic planning, process modelling, awareness, attractiveness, branding, fundraising and financial stability as prerequisites to fulfil university's mission.

On the downside the insufficient connections between main process of university activities such as higher education (study process) and research and development, lack of support from university administrators, lack of funding, time, data access, training, standard definitions of concepts, resistance to change and short-term profits mentality could be seen as main obstacles to achieve that mission (Velazquez, Munguia, & Sanchez, 2005).

All organizations pursue to generate value with limited resources. An organization can become economically sustainable by readjusting its strategies in order to become socially and ecologically sustainable (Dumitrascu & Ciudin, 2015).

The universities still are seen as lighthouses for society and their strive and ability to minimize its environmental impact in a context of the green and circular economy through their daily activities are expected. It can be reached through the operational dimension of the university system. The system involves initiatives such as environmental management systems (EMS), implementation of ISO 14001 standard, "green buildings" and campus operations. In this way, day-to-day organizational management of university needs to address special attention to environmental issues on the use of resources, especially energy and campus buildings.

Education for sustainable development is seen as an area of university activities which is surrounded by challenges of a complex and increasingly knowledge-driven global economy followed by the emergence of a 3rd mission, technology transfer and entrepreneurial behaviour (Beynaghi, Trencher, Moztarzadeh, Mozafari, Maknoon & Leal, 2016). To correspond the needs of contemporary society curriculum of higher education implemented through the study programmes, it's learning outcomes, mode of studies, interdisciplinary, internationalization and extra curriculum activities should be related to contemporary global economic focus as green and renewable economy, poverty eradication, promotion of productive and decent employment, sustainable consumption and production.

Alltogether these factors reveal the diversity of the higher education sector and the complexity of university activities as key player in this environment. In the next part of this chapter, the theoretical analysis of quality management concepts for higher education institutions is revealed.

1.3. Quality Management Concepts for Higher Education Institutions

One of the assumptions of the sustainable economic performance of organizations is their ability to meet the quality dimension. During the last decades, the universities also faced this challenge and needed to find a ways how to adapt this to their activities.

The dimension of the quality of higher education has gradually developed from the second half of the 20th century and is related to a number of factors, the most important of which is the scale of a growth in higher education, i.e. an increase in the number of institutions and students. The phenomenon of the rising figures of higher education has been determined by two main factors: a rapid growth in the global economy and intensive technological development. The latter is also important due to the fact that knowledge which was the key element of former higher education and had to be devoted most of time and effort, rapidly

and inexpensively became available to a larger part of society. Massiveness, internationality and marketing have become the strongest factors affecting changes in the sector of higher education (Harvey & Williams, 2010).

The introduction of industrial quality models, particularly those of global quality management, in higher education has had a marginal effect, except for an increase in evidence that institutional management, or more specifically its level, has made an impact on the quality of activities. The language, terminology and other instruments arising from the business environment are not always relevant to higher education (Houston, 2008). A number of authors Barrett (1996), De Jager & Nieuwenhuis (2005), Meirovich & Romar (2006), Houston (2007) have explored the problems and difficulties encountered in implementing TQM principles at higher education institutions.

It should be taken into account that no universally accepted concept of quality education has been formulated. The reason for why a single general definition of quality cannot be proposed is that quality cannot be accurately measured or assessed. All types of evaluation are of the biased nature. No single appropriate definition of quality is available because quality itself is concerned with stakeholders and is of a personal nature (Harvey & Green, 1993). Thus, due to the intricacy of the concept itself, the complexity of quality often remains uncertain (Harvey & Newton, 2004).

Despite the intricacy of the phenomenon, scientists strive for defining the quality of higher education. In 2003, Kestutis Pukelis, a professor of Vytautas Magnus University and one of the most prominent researchers of the quality of higher education in Lithuania defined the quality of higher education as "the wholeness of the features and characteristics of a product or service demonstrating the ability to meet the claimed or implied needs". A decade later and following changes in the context of higher education, the same author presented a new, broader definition of the same phenomenon: the quality of higher education was accepted as an agreement of social stakeholders on appropriate conditions for developing student self-education and readiness to compete in the changing labour market considering the (self) established quality standards, institutional goals and current and predicted strategic needs for developing democratic society. The definition of quality depends on the agreement of social stakeholders with reference to the selected concepts of quality. The agreed definition of the quality of higher education tends to integrate three applied concepts of quality in the system of higher education: quality as compliance with the specified requirements, set objectives and the needs of customers (Pukelis & Smetona, 2014).

Quality assurance, management and improvement in higher education have been extensively studied since the second half of the 20th century. Yet in the 1980s, Astin identified 5 different approaches to quality: mystical, image (reputation), resource, consequences and added value (Astin, 1980). Harvey and Green (1993)

divided quality into three categories: quality with no errors, quality as compliance with the purpose, quality as (monetary) value. The authors also proposed their approach "quality as change" as an alternative to those described above (Harvey & Green, 1993). Next, in 1995, 5 institutional approaches to quality, including elite, populist, persecution, rationality, and unification, were adopted (Berguist, 1995). Later, other authors suggested a holistic model for quality in higher education separating teaching-learning functions from those of the services provided by the university (Srikanthan & Dalrymple, 2002). Also, the political dimension of quality was highlighted. Due to political assumptions, the quality of the definitions offered by stakeholders may be contradictory and incompatible with each other (Harvey & Green, 1993); (Skolnik, 2010); (Newton, 2010).

There have been a number of attempts to evaluate quality in higher education institutions from different perspectives during the last decades. The basis of the dimension (model) of systemic quality is the idea that higher education changes in response to the external environment (Berger & Milem, 2000); (Peterson, 2007). Another approach is quality as compliance with the standard. As for the sector of higher education, the "standard" means the level of compliance of conditions the institution or programmes conform to in order accreditation agencies should be approved (CHEA, 2002). If quality is the answer to the question "is it good", the standard provides an answer to the question "is it good enough" (Brink, 2010). Although the approach "quality as compliance with the purpose" has been accepted by a number of actors of higher education policy, however, it has also been criticized. The concept of compliance with the purpose is found to be misleading because the recipient of the service – the customer – is not always the right person in higher education to determine personal needs and to decide whether they are satisfactory (Harvey & Green, 1993). Thus, the concept of quality was narrowed down to the compliance of the product or service with the purpose (Elassy, 2015). It is also not easy to define or agree on what goal of higher education should be. The identified goals may depend on the involved group or stakeholder.

Quality as the approach "efficiency striving for institutional goals" is a variation of the model "compliance with the purpose" where quality is accepted as advancement in the higher education institution that is a mature organization pursuing a clear mission and having an idea of achieving the established goals (Green, 1994); (Elassy, 2015).

Understanding quality by stakeholders involves the stakeholders that are users and customers having interests, making impact and representing the higher education institution (Shanahan & Gerber, 2004).

Quality as a tool for meeting customer-expressed needs is the approach emphasizing customer identification, its needs and the ways to satisfy them (Morley, 2003). In this case, identifying a "customer" that may act as a student, an employer, society, a local and global professional sector, e.g. guild etc. is the most

difficult task. If we limit ourselves to the "student", more questions about the share of the "customer" and the share of the "product" arise. The reviewers of this approach also ask whether students themselves can identify and express their own needs in terms of quality.

Literature suggests different versions for defining a "customer". The ISO 9001 standard offers a brief definition of the customer, which is "an organization or person that receives a product". The Malcolm Baldrige National Quality Award (MBNQA) presented in the USA describes the customer in a wider context as "the current or potential customer (user) of the products or services provided by the organization". Quality guru J. Juran defines the customer as "anyone affected by a product or process used for creating another product" (Juran, 1999). The Swedish Institute for Quality points out that the customer is the person "for servicing which the organization is involved" (2002). A client is a person for whom an organization seeks to create value (Bergman & Klefsjö, 2003).

Other authors distinguish quality perceived by academicians. Newton (2000, 2002) and later Anderson (2006) notes that academicians find quality as bureaucracy, a burden, a game and a way for executives to gain more power (Newton, 2000; Newton, 2002; Anderson, 2006).

Quality perceived by students is primarily understood as a decent teaching and learning process (Gatfield, 2000) and the professional and skilful teaching staff (Hill, Lomas, & MacGregor, 2003). Dill and Beerkens states, that the quality of higher education is represented by graduate student competencies directly linked to the role of the higher education institution in society (Dill & Beerkens, 2010).

Appropriate scientific journals have investigated the above-introduced topic, for example, *Quality in Higher Education* (ISSN: 1353–8322) by Taylor & Francis Publishing Group issued since 1995. Journal *The Quality of Higher Education* was published at Vytautas Magnus University, in Lithuania. At the international level, scientific articles most frequently have quoted the articles of the authors such as D. Green, L. Harvey, J. Newton, M. Cheng, D. Houston, D. Westerheijden, P. Perry, A. K. Elshennawy, T. Saarinen, etc. who have focused on the quality of higher education.

The analysis of methods and measures used by Lithuanian and foreign universities for showing social partners and society techniques applied for ensuring the quality of their activities demonstrates that universities promote the initiative in validating their activity thus striving for national or international quality awards. For example, Vilnius Business College was awarded the national quality prize in 2008, and Vilnius Gediminas Technical University (VGTU) was given the same prize in 2010. In 2004, Vilnius University and in 2008 VGTU voluntarily participated in the institutional evaluation of higher education institutions carried out by the European University Association (EUA).

The introduction of ISO standards for quality management systems is widespread among universities. Yet in 2001, Lithuanian Maritime Academy was one of the first higher education institutions that implemented the quality management systems according to the ISO 9001 standard. Vilnius Business College joined in 2006, International Business School at Vilnius University, Kaunas Technical College and Vilnius Cooperative College in 2008. Vytautas Magnus University and Klaipėda University implemented integrated quality management systems (QMS) according to several standards, including the ISO 9001 standard, in 2013 and 2014 respectively. In 2015, VGTU also implemented QMS according to the ISO 9001 standard.

A wide variety of higher education institutions worldwide have implemented ISO 9001 standard. A number of authors have analyzed the value of ISO 9001 standard accreditation. To analyse the experience and practice of implementing ISO standards at universities, a number of scientific publications have been prepared (Senčila & Skiparienė, 2007); (Milisiunaite & Adomaitiene, 2009); (Papadimitriou & Westerheijden, 2010); (Basir, 2012); (Kasperavičiūtė, 2012); (Kasperavičiūtė, 2013); (Serafinas, 2009). Research papers examining experiments on the insufficiently successful implementation of the ISO standard at universities can also be found (Sroufe & Curkovic, 2008).

The higher education institutions in the fields of business and economics worldwide position themselves as the exclusive establishments of higher education, and achievements in their activities are sought to be shown by accreditation provided by world famous associations. The higher education institutions of this kind seek the so-called triple accreditation provided by business associations AACSB, AMBA and EQUIS. According to the data collected in 2019, only 97 higher education institutions were awarded "triple accreditation" worldwide. Each of these organizations has developed separate methodologies the requirements included in which are expected to be fulfilled by universities in order to achieve accreditation, while the preparation and accreditation process takes between 1 and 6 years. Compliance assessment and accreditation for universities cost tens of thousands a year. Many authors agree that the choice and implementation of quality management systems is a clear responsibility of higher education institutions themselves.

The efforts to evaluate quality in higher education is not very new. It comes from the efforts to find a key elements of quality of universities. According to Serafinas et al. (2008) "The main mission of university education is to meet the needs of the individual and society in terms of cognitive development and excellence." (Serafinas, Ruževičius, & Daugvilienė, 2008). In contemporary socioeconomic context, the universities perform three inter-related missions: 1) education (university level studies); 2) research and development and (3) so-called the "3rd mission" that connects university's scientific activities with the external economic

and social worlds. Labanauskis and Ginevičius revealed the complexity of university activities, and the role of stakeholders leading to the development of higher education services in 2017 (Labanauskis & Ginevičius, 2017).

Searching of quality of universities activities the application of Total Quality Management (TQM) principles and idea of continuous improvement also attracted the attention of researchers (Mehralizadeh & Safaeemoghaddam, 2010); (Leskauskaitė & Pivoras, 2012); (Asif, Awan, Khan, & Ahmad, 2013); (Psomas & Antony, 2017).

Fig. 1.2. The summary of different scientific approaches to quality of higher education based on literature analysis (compiled by author)

Quality Assurance is one of the approaches which has been widely discused and analysed by scientists worldwide. Ways and possiblities to integrate students in quality assurance procedures (Elassy, 2013); (Elassy, 2015). A case from Georgia analyses the involvement of academic staff in internal quality assurance in universities (Shurgaia & Shurgaia, 2015), the quality assurance and national accreditation policy of higher education in Egypt (Schomaker, 2015), the effect of quality assurance in private higher education institutions in China (Cao & Li, 2014) recent reforms in higher education (Bao, Kehm, & Ma, 2018); (Alemu, 2019); (Mizala & Schneider 2019) has been reviewed.

The summary of different scientific approaches to the quality of higher education is provided in Figure 1.2.

Research papers that attempt to validate and expand the quality management model for universities has been reviewed. An analysis of the relationship between university autonomy and control over quality management (Beerkens, 2011), university transformation and external assessment in Finland (Haapakorpi, 2011) and

importance of process management in higher education institutions (Kettunen, 2012). The search for quality can be performed form university ranking perspective (Agasisti & Johnes, 2013); (Erkkilä & Piironen, 2014); (Blanco–Ramírez & Berger, 2014).

In order to firmly focus on the analyzed area, quality assurance, as one of the dimension elements of quality in higher education, will be explored in detail.

1.4. The Development of the Concept of Quality Assurance at Universities in the Context of the Bologna Process

The concept of quality assurance in higher education started to be developed by scientists in the 1990s. Literature analysis provides attempts made by the authors to classify quality assurance, for example, identifying "retrospective" based on accountability and "future" the basis of which is the element of improvement (Biggs, 2001). Another research paper divides quality assurance into three parts: internal, interrelated and future. "Internal" quality assurance focuses on improving the internal environment and processes in order the efficiency of training and learning should achieve the set goals. "Interrelated" quality assurance aims to ensure that education services should meet the needs of stakeholders and be accountable to the public. "Future" quality assurance strives for ensuring the relevance of educational goals, content, practices and outcomes for future generations (Cheong Cheng, 2003).

Quality assurance has been implemented more like a regulatory tool for operational processes rather than the check of the quality of the product (outcome). This is the case for Finland that has introduced an audit of the quality assurance system in accordance with Guidelines for the Bologna Process seeking comparable quality assurance systems (Morley, 2003).

Harvey calls quality assurance as "a process to establish stakeholder confidence when elements (input, process, results) meet expectations or are measurable in terms of minimum requirements" (Harvey 2011). Another definition of quality assurance provides for the periodical self/assessment of the quality of the institution or subdivision on the basis of the obtained results of which the quality of studies is improved (Pukelis & Smetona, 2014).

It can be recalled that the dimension of quality assurance in higher education has been actively developed since 1999 through the Bologna Process implemented in Europe. This process, as a voluntary club of the EU Member States, has become one of the most developed examples of higher education networking in Europe in the last decade of the 20th century and laid the foundations for closer cooperation

between individual countries in the field of higher education. Yet in 2001, Westerheijden argued that the Bologna Process was aimed at making European higher education more transparent and at promoting the development of a clearer quality assurance process (Westerheijden, 2001).

It should be noted that research papers do not unequivocally positively evaluate the Bologna Process. Some authors argue that the Bologna Process has given the European Commission the opportunity to affect national higher education in the EU Member States (Keeling, 2006), (King, 2008). From a transatlantic perspective, many North American scientists complain that the Bologna Process is becoming more like a fortress rather than a bridge, and therefore the USA perceive this process as a potential threat to the dominance of the US scientists on a global level (Zeng, Adams, & Gibbs, 2013). It should be considered that various regions understand this process in a different way. For example, in the European context, the Bologna Process is accepted as a tool for inspection and improvement, in the US – as an instrument for analysis and evaluation and in Latin America – as a dispute and simulation (Zeng, Adams, & Gibbs, 2013). Scientists have also distinguished the groups of countries by the region and their priorities in implementing provisions for the Bologna Process: the priority for Western European countries is the structure and quality of their higher education programmes, new EU Member States find social transformation as an important component, and non-EU countries prefer the opportunity to chase the EU Member States (Esyutina, Fearon, & Leatherbarrow, 2013).

Since the very beginning of the Bologna Process, the quality of studies has been highlighted as a top priority for developing higher education in Europe (Figure 1.3). The assurance of the quality of studies is considered to be an important part of academic professionalism and the key element in building institutional reputation or uniqueness in both competitive markets local and global (Paliulis & Labanauskis, 2015).

In 2005, the development of the Bologna Process and the systematisation of the policy on higher education quality in European countries resulted in the adoption of European standards and guidelines (ESG) for the internal quality assurance in higher education institutions. The document defined the internal quality of studies at the university and included 7 areas (ENQA, 2009):

- policy and procedures for quality assurance;
- approval, monitoring and periodic review of programmes;
- assessment of students;
- quality assurance of teaching staff;
- learning resources and student support;
- Information systems;
- public information.

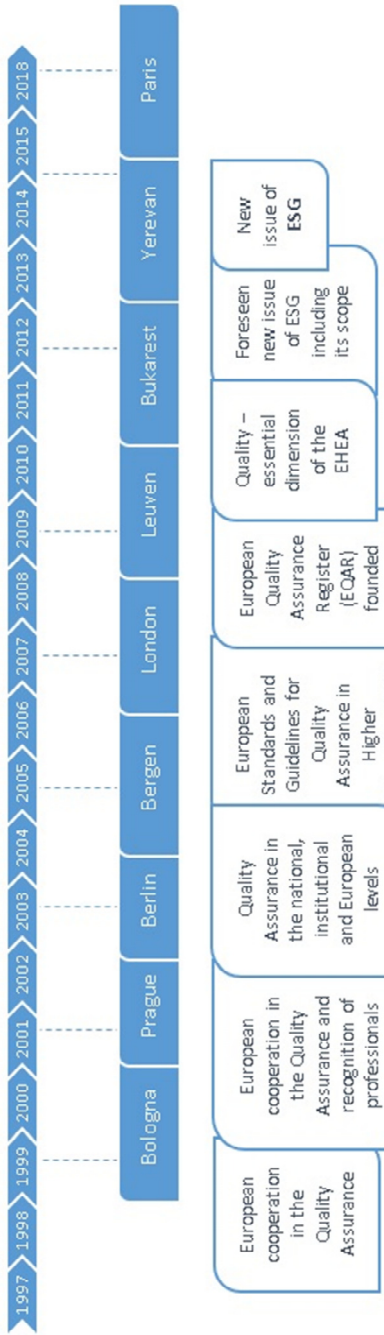

Fig. 1.3. Development of quality dimension in Bologna Process Communiques (compiled by author)

At the same time, ESG did not set quality standards for higher education institutions, i.e. did not identify what was considered to be good quality at the university. Nevertheless, the document relied on clear principles such as:

- Responsibility for the services provided and their quality assurance lies primarily with the university.
- Quality assurance processes are adapted to the diversity of higher education systems, institutions and programmes.
- The quality assurance process involves and considers the expectations of stakeholders and society.
- Quality assurance assists with developing a quality culture.

To sum up, it can be stated that ESG consolidated provisions that should be followed by universities creating the internal quality assurance system and adopted guidelines for the institutions assessing the quality of studies at universities (Paliulis & Labanauskis, 2015). It should be noted that the 2012 Conference of European Ministers Responsible for Higher Education was held in Bucharest and reiterated that quality assurance was crucial to building trust and would become public responsibility (accountability) involving various stakeholders. Meanwhile, in 2015, ESG standards and guidelines updated in the Bologna Process emphasized that quality assurance had two main goals – quality improvement and accountability. For quality assurance, the concept "quality as a suitable tool for achieving the goal" was preferred, i.e. quality assurance had to guarantee the learning environment where the curriculum of study programmes, study conditions and infrastructure should be appropriate for implementing intended goals (ENQA, 2015).

The Law on Science and Studies of the Republic of Lithuania (2016) stipulates that higher education institutions are responsible for the quality of studies and each of them must have an internal quality assurance system based on the provisions for quality assurance in the studies of the European Higher Education Area. However, 11 of 18 higher education institutions were included into the process of external evaluation thus suggesting improvements into their internal quality assurance systems by linking them more closely to European standards and guidelines for quality assurance. It has been noticed that still some higher education institutions do not have quality management systems, and apply only separate quality assurance measures (Balevičienė, 2013).

The perception of standards and guidelines for quality assurance by European countries is vividly shown by the figures of the research conducted in 2011. The author A. Rauhvargers analyzed how the states participating in the Bologna Process succeeded in implementing ESG principles in the process of developing and implementing national quality assurance and quality management systems at uni-

versities. The study demonstrated that some of the universities introduced management systems that focused on assessing the activities of employees or units rather than on their compatibility with ESG. Some states declared that internal quality assurance in their universities was based on International Quality Standards (ISO), the European Foundation for Quality Management (EFQM) model or the principles and methods for Total Quality Management (TQM) (Rauhvargers, 2011).

To summarize the material analyzed in scientific papers, quality assurance at universities can be considered as the one conforming to external standards, implemented from the "top" to the "bottom", related to assessment and reporting, accepted as a cumulative process characterized by quantitative results obtained from the analysis of the activities of the previous period, having consistent execution and rules as well as providing more space for decision-making initiated by the administration of the university. In addition, insufficient attention is paid to teaching and learning processes. The quality assurance approach relates to billing, self-assessment and performance indicators but ignores research on learning innovations. Quality in terms of "assurance" is more commonly encountered in a hostile manner and is known more as a concern felt by executives rather than by academicians (Elassy, 2015).

Scientific literature analyses the other aspects of university activities – quality improvement is accepted as a concern for enhancing teaching and learning experiences. Otherwise, quality improvement will be "a part of the quality assurance process aimed at organizing quality management of the institution or unit to meet requirements for quality standards". Quality improvement, in turn, will be "a university initiative aimed at a higher quality of study rather than that provided by national quality standards and involving the development of new more advanced world-class quality standards and the creation of instruments for achieving them" (Pukelis & Smetona, 2014).

There is a continuum between quality assurance and quality improvement, which means that quality assurance is the right tool for assessing the institution or process, whereas quality improvement is the appropriate instrument for developing or advancing the institution or process.

In the first decade of the Bologna Process, the concept of quality in the EHEA was shaped as a quality assurance paradigm. Quality assurance is based on the self-assessment and evaluation of the university (Pukelis & Smetona, 2014), and therefore can be considered as a necessary but only the initial component of the concept of quality. The construct of the complete concept of quality should consist of the elements of quality assurance, quality improvement and quality advancement.

This section of the thesis started disclosing the multiple (multidimensional) nature of the quality construct at universities. However, another important aspect

of analysing preconditions for the sustainable economic development of universities is the question how quality is treated and accepted by higher education policymakers, universities *per se*, national or international agencies assessing them and other participants directly or indirectly involved in university activities or in obtaining results.

1.5. Variety and Role of Stakeholders Involved in University Activities

The analysis of sustainable development and quality management emphasizes the importance of stakeholders for university activities. Three major challenges to universities have been identified in the nearest future: 1) the need to increase prestige and market share; 2) the need to adopt the entrepreneurial mindset; 3) the need to advance synergy and common value creation with the key partners, i.e. or social stakeholders (Pucciarelli & Kaplan, 2016). For this reason, it is appropriate to examine in more detail the diversity of stakeholders surrounding the university, their needs and expectations for universities. Scientific literature has broadly developed the theory of social stakeholders and provided quite a few definitions of social partners, including "all representatives (agents) for which organizational growth (development) and its prosperity play the key role" and "any individual or group that can affect or be affected by the implementation of the company's goals" (Pesqueux & Damak-Ayadi, 2005); (Bourne & Walker, 2005);
(Wagner Mainardes, Alves, & Raposo, 2012).

Up-to-date quality management refers to a number of different "stakeholders" or "customers" treated as the recipients or users of the services provided by higher education institutions. Although both terms are found in research papers, still, the term "stakeholders" is considered to be less controversial in the context of higher education (Lagrosen, Seyyed-Hashemi, & Leitner, 2004); (Iacovidou, Gibbs, & Zopiatis, 2009).

The stakeholders acting in higher education are attracted to the activities of the higher education institution and are usually divided into internal and external (see Figure 1.4) or primary and secondary ones (Jongbloed, Enders, & Salerno, 2008); (Garvare R. & Johansson P., 2010); (Wagner Mainardes, Alves, & Raposo, 2012); (Mainardes, Alves, & Raposo, 2013).

The university is an intricate-nature organization surrounded by a large number of different stakeholders the interactions and expectations of which are of particular importance. The university is the key part of the "ecosystem" surrounded by partners, and therefore creating the maximum value for them should be one of its activities priorities. However, the challenge is that the expectations of the above-mentioned partners are very different and often do not match.

Stakeholders look at universities from different sides, for example, employers and business groups put emphasis on the economic perspective, the current or future student families and community organizations point out a social outlook, academicians and other providers of educational services are more focused on the educational point of view. Frequently, external stakeholders find university activities primarily in the local context while others are – in the national or international context (Houston, 2008).

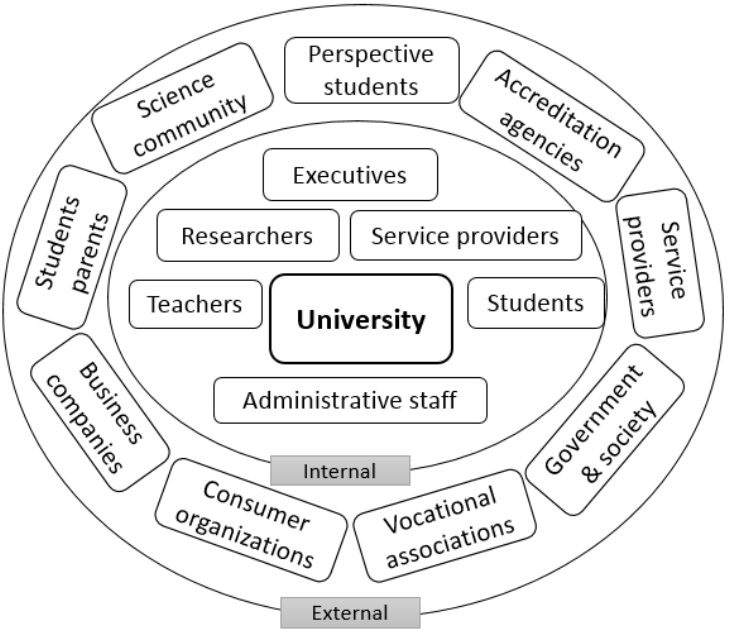

Fig. 1.4. Internal and external stakeholders attracted to the activities of universities (compiled by author)

In 2013, John Borwick prepared a map of US higher education partners thus highlighting external partnership and their interrelationship and with the higher education institution (Borwick, 2013). Figure 1.5 indicates an adapted and supplemented map showing the relationship between the university and its surrounding partners.

The Government adopts legal regulation (secondary legislation), allocates funding to higher education institutions, provides financial support to students (scholarships, loan interest compensation, etc.) and creates jobs filled by both graduates and students. Accreditation bodies evaluate and certify higher education institutions and study programmes as well as impart information on higher edu-

cation institutions, which is relevant and useful for the Government making decisions, school graduates (e.g. opting for studies), the current students and their parents. Media and rating agencies carry out research and disclose information that may be useful for school graduates and their parents, students and higher education institutions. Higher education institutions provide alumni with identification and various occasional events, for instance, suggestions for upgrading qualifications. Alumni themselves provide feedback and support to the higher education institution. Also, alumni are invited to deliver lectures to the students and can share the practical experience of participating in the events. Higher education institutions provide students with information about the opportunity to study in order to attract them to become students.

Parents pay for their children's (student) studies and support them in other ways. Various funds sponsor higher education institutions, offer scholarships and financial support higher education programmes. Non-governmental (non-profit) organizations expect assistance from higher education institutions and voluntary actions from students. Higher education institutions compete for learners, collaborate and are involved in different networks. Students can move from one higher education institution to another and carry on studies. Procedures for earning and transferring credits are employed. Private business and enterprises are one of the key performances of the stakeholders of the higher education institution. Orders are placed to the Government and lobbying activities are conducted for training specialists from the state funds. Employers participate in the management of higher education institutions and study programmes, give scholarships, grants and placements for students, create new jobs filled by students and graduates. The complete activities of the higher education institution and the obtained results seen by the public, in a broad sense, suggest (mean) economically active (working) and broad-outlook people capable of understanding and analysing world reality as well as reading and identifying various forms of information, environment and signs. All this represents the level of educated society and the potential for culture and creativity (self-expression).

The above scheme for relationship treats the higher education institution and the student as the subjects having the greatest share of the expectations and interests of different stakeholders.

The teaching staff and students are accepted as the main persons working in the higher education institution, and therefore, the clarification of their quality concept is extremely important. The teaching staff find quality as something negative and involving bureaucracy and burdens. For students, quality is related to lectures, the learning process and teaching staff, but they only appreciate services frequently offered lacking experience (or opportunity) in comparison with other providers of similar services (Elassy, 2015).

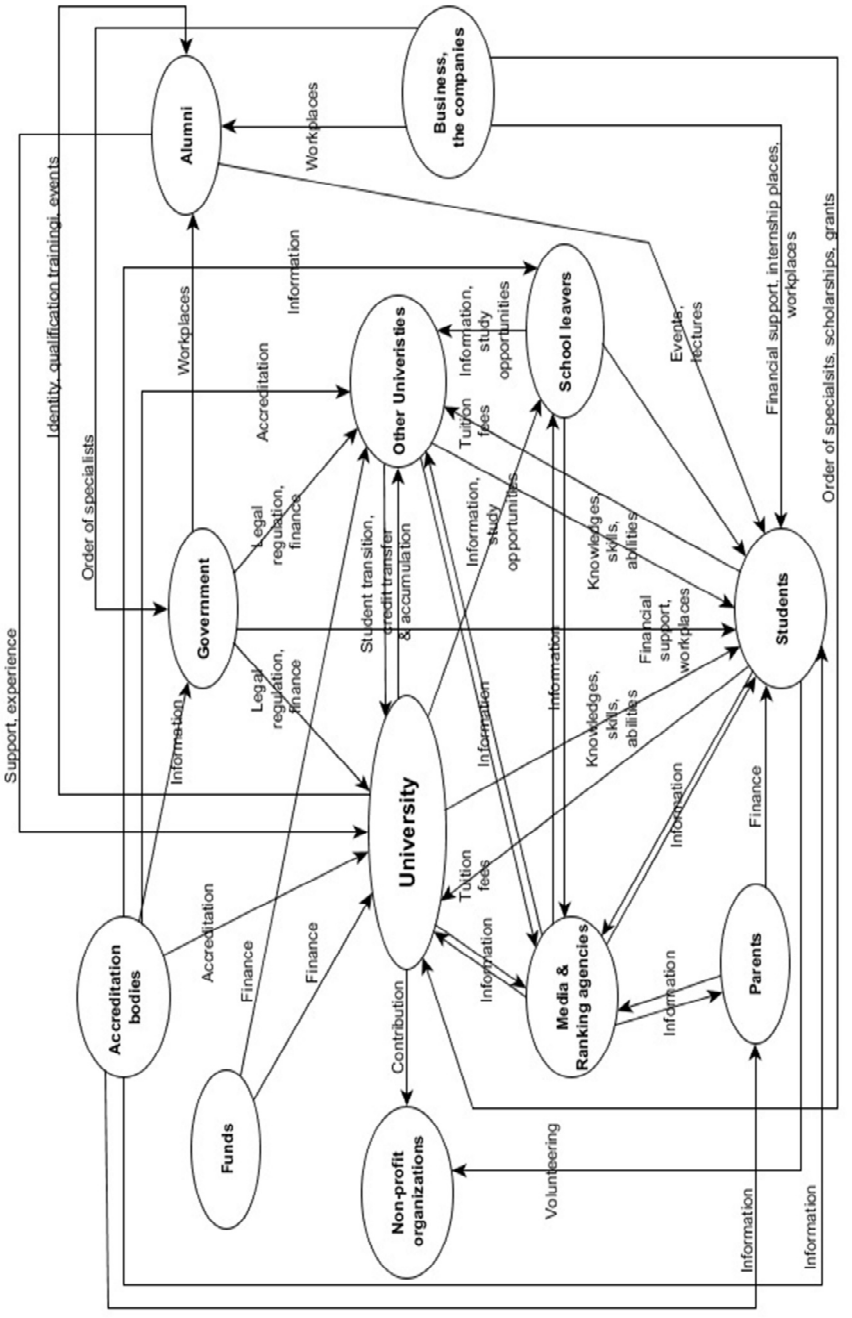

Fig. 1.5. Map and linkages of stakeholders' groups in universities. Compiled by author based on Borwick 2013

Having analysed the abundance, diversity and expectations of external partners, the importance of business, the labour market and an interest in the processes and outcomes of higher education can be assessed. Some stakeholders act from an economic outlook while others are more exposed to public positions (Eagle & Brennan, 2007). At the same time, it should be noted that this map does not disclose the relationship between the stakeholders acting inside the university, which includes a few levels of administration (university, faculty, department), teaching staff, doctoral students, young scientists and service staff.

In order to put emphasis on the impact of the environment, it is appropriate to identify higher education institutions according to their founder. For state-established higher education institutions, the Government remains the main source of funding higher education (state-funded study places, targeted funding) and the most important stakeholder. Non-state (private) higher education institutions do not receive funds from the Government for their activities. However, they operate under the same conditions (legal regulation of higher education, institutional and study programme accreditation) as state higher education institutions. Thus, the competitive environment for non-state higher education institutions is not favourable.

This scheme clearly demonstrates the changed and expanded mission of universities from conducting studies or conveying knowledge and researching to providing services to the community (society) and a new type partnership with the surrounding environment (Jongbloed, Enders, & Salerno, 2008). Stakeholders act as partners, sponsors, content makers and agents of changes. The presented picture creates conditions for naming the stakeholders involved in university activities and for assessing their potential impact and effect on the university.

The analysis of the impact of social stakeholders on the organization demonstrates that the latter changes in sustainability do not necessarily have to start from staff training, but exactly their inclusion and empowerment are considered to be the essential element for the organization to achieve changes (Barth & Rieckmann, 2012).

To sum up, it should be underlined that, in order to achieve sustainable development at the university, it is necessary to assess social stakeholders surrounding the institution and to consider and match their needs and expectations.

1.6. Conclusions of Chapter 1 and Formulation of the Tasks of the Dissertation

Based on the analysis above, the following conclusions can be made:

1. From a theoretical perspective, university activities for economic sustainability is derived from its ability to correspond to two main dimensions: sustainable development and quality management. The analysis of scientific literature has revealed that the concept of sustainable development is more frequently analysedby analysed by various scientists worldwide at the macro level, such as at the state or regional, rather than at the micro level at the level of the organization or institution. The micro level could become a perspective field for the future research.
2. The implementation of provisions for sustainable development in higher education is tightly related to the role of the university as a participant of the higher education system. It has been established that the individual components of the concept of sustainable development in university activities are analysed integrally rather than separately. Sustainable development at universities is an accepted concept in the guidelines for strategic management, the operational arrangement of activities, and the opportunity to update study programmes and curriculum. Literature analysis has revealed that sustainable development allows for the comprehensive preparation of the organization for permanent changes and highlights the importance of organizational learning to manage these changes.
3. The scientific literature has widely considered various aspects of quality management at universities. The lack of a single definition of quality impedes the examination of university activities in the context of sustainable development. Despite this, the provision for quality assurance that is enshrined in the Bologna Process indicates the direction of developing quality assurance for European universities. Researchers have agreed that it should be universities that should select and agree on appropriate methods and patterns for achieving quality.
4. The diversity of social stakeholders and their relationships with the university partly reveals a failure to frame the unified concept of quality at the university while also demonstrating the intricacy of university activities.

Accordingly, the literature analysis allows for the formulation of further tasks such as selecting a suitable quality management technique for expanding university activities, setting up relevant criteria defined by the experts, developing the algorithm for system calculation, providing a multi-criteria evaluation method that will be applied for theoretical simulation, and modelling a system based on quality management techniques that will help universities with achievements in sustainable economic development and in the examination of the model's appropriateness for assessing the preferred universities.

2

Theoretical Modelling of the University Economic Sustainability

This chapter of the dissertation deals with quality management concepts and methods the use of which should lead the university activities to strive for economic sustainability. With reference to the analyzed quality management methods applied in higher education institutions, the methodology for empirical research has been developed. Considering the concept of sustainable development combining several areas (economic, social and environmental), the methodology for empirical research mainly concentrates on economic criteria and conditions that could enable universities to succeed in sustainable economic development. Thus, the quality management method for developing university activities has been selected. Research methodology consists of the expert survey on the required areas, the criteria composing them in order to develop economic activity (qualitative part) at the university as well as selecting and applying the multi-criteria assessment method. Taking into account the comprehensiveness of university performances, the studying process only has been preferred as the object of the carried out analysis.

The findings of this chapter were published in the scientific article by Labanauskis, Ginevičius 2017.

2.1. The Algorithm for the Comprehensive Assessing of the Quality of the Study Process at the University

Chapter 1 discussed the concepts of sustainable development and quality management as a main fields of university activities for economical sustainability. The complexity and depth of the concept of quality focused on the diversity of stakeholders were disclosed. Although no exact answer for how universities should respond to growing intricacy and instability has been provided, however, it is accepted that there are activities that need to be implemented as possible mechanisms to successfully overcome the encountered problem (Altbach, Reisberg, & Rumbley, 2009a). Conti (2011) argues that "setting the right goal and providing appropriate tools for achieving it is definitely the most important success factor, although the global world of the interlaced systems simultaneously accepts it as concern and impact the activities of the organization has on stakeholders, particularly on the public" (Conti, 2011).

The scientific papers of Lithuanian and foreign scientists focused on a thorough analysis of the examples of applying and implementing quality management models and methods in higher education institutions. The opportunities and experience of enforcing international ISO 9001: 2000 at colleges were analyzed by (Kučinskienė, 2005); (Venkatraman, 2007); (Caraman, Lazar, Bucuroiu, Lungu, & Stamate, 2008); (Papadimitriou & Westerheijden, 2010); (Burli, Bagodi, & Kottursheltar, 2012); (Dumond, 2013) the experience of applying and maintaining ISO 9000 series quality management principles was considered in Lithuanian Maritime Academy (Senčila & Skiparienė, 2007), an attitude of higher education and study institutions to ISO 9001 and the motives, problems and benefits of employment were discussed in (Kasperavičiūtė, 2012). Also, the application of the EFQM quality model (Gómez, Costa, & Lorente, 2011), benchmarking (Kettunen 2010), the assurance of service quality (Tsinidou, Gerogiannis, & Fitsilis, 2010); (Sultan & Wong, 2010) and the cases of implementing the principles of global management at universities (Mehralizadeh & Safaeemoghaddam, 2010) were studied.

The evaluation of the explored concepts of sustainable development and quality management and the assessment of complexity university activities results in the identification of the so-called main processes of activities, including (1) studies, (2) research and innovation and (3) the 3rd mission of universities. In order to specify and define the topic to be analyzed, the need to create an algorithm for the comprehensive assessment of the studying process at the University is presented in Figure 2.1.

The proposed algorithm composed of 4 stages. The first stage comprises five steps. The analysis of the comprehensiveness of university activities is the first step, which is followed by the analysis of ESG provisions relevance to assessing

quality assurance of university. These two steps give us the first list of criteria for the quality assurance system of the study process. The survey of experts will make a justification to determine the link between criteria for the study process quality assurance system and the concept of sustainable development. According to the survey results, the final list of criteria will be prepared.

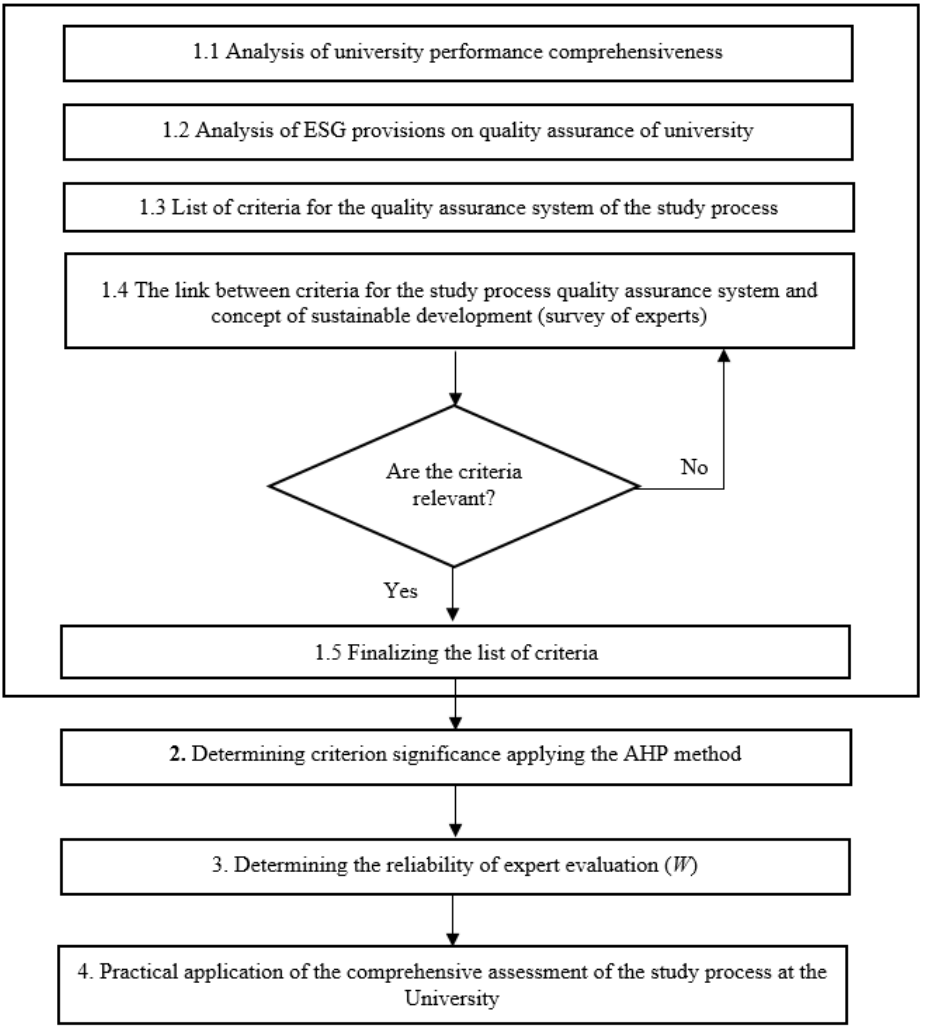

Fig. 2.1. An algorithm for creating a comprehensive assessment of the university study process (compiled by author)

The second stage is devoted to determining criteria significance by applying the multi-criteria decision-making method. Evaluation of the reliability of expert evaluation will be the next stage. The practical application of the comprehensive assessment of the study process at the university will be the final stage of the performed research.

2.1.1. Analysis of Comprehensive University Activities Using the Cause and Effect Diagram

Fadeeva et al. state that quality assessment is a kind of transformation emphasizing the need to involve various internal and external stakeholders interested in changes at the university (Fadeeva & Mochizuki, 2010). In order to reveal the intricacy of university activities, the cause and effect diagram created by Japanese scientist Kaoru Ishikawa has been preferred. A classic example of using this method includes the analysis of the selected problem when the causes determining it most frequently fall into five categories such as personnel, methods, equipment, measuring instruments and environment thus pointing out the sources of problem components.

The logic of this method assists with naming the most important areas of university activities. Thus, it is possible to identify the most decisive university activities determining its economic development.

With reference to the analysis of research papers, the complete activities carried out at the university covers five areas, including study, scientific activity and its commercialization, communication strategy, management, buildings and infrastructure and the environment (Figure 2.2). Each of these areas of activities involves the interaction of the above analyzed social stakeholders.

The first area of activities studies covers the portfolio of the offered or underdeveloped study programmes, different forms of study (full-time, partial, distance learning), training courses, open online learning courses, career or open door days. The establishment and support of special general education schools or classes. As a part of study programmes, research and art activities form this category. It should be noted that this area of university activities is one of the most important to internal (students, teachers, administrators) and external (employers) social stakeholders. The monitoring and analysis of this area well reflect the smooth and efficient operation of everyday university activities.

The area of Research and development consists of research production, including articles, patents, citation indices, holding conferences and university representation at seminars abroad. Outsourcing, applied and fundamental research and research projects. Contracts with companies and organizations.

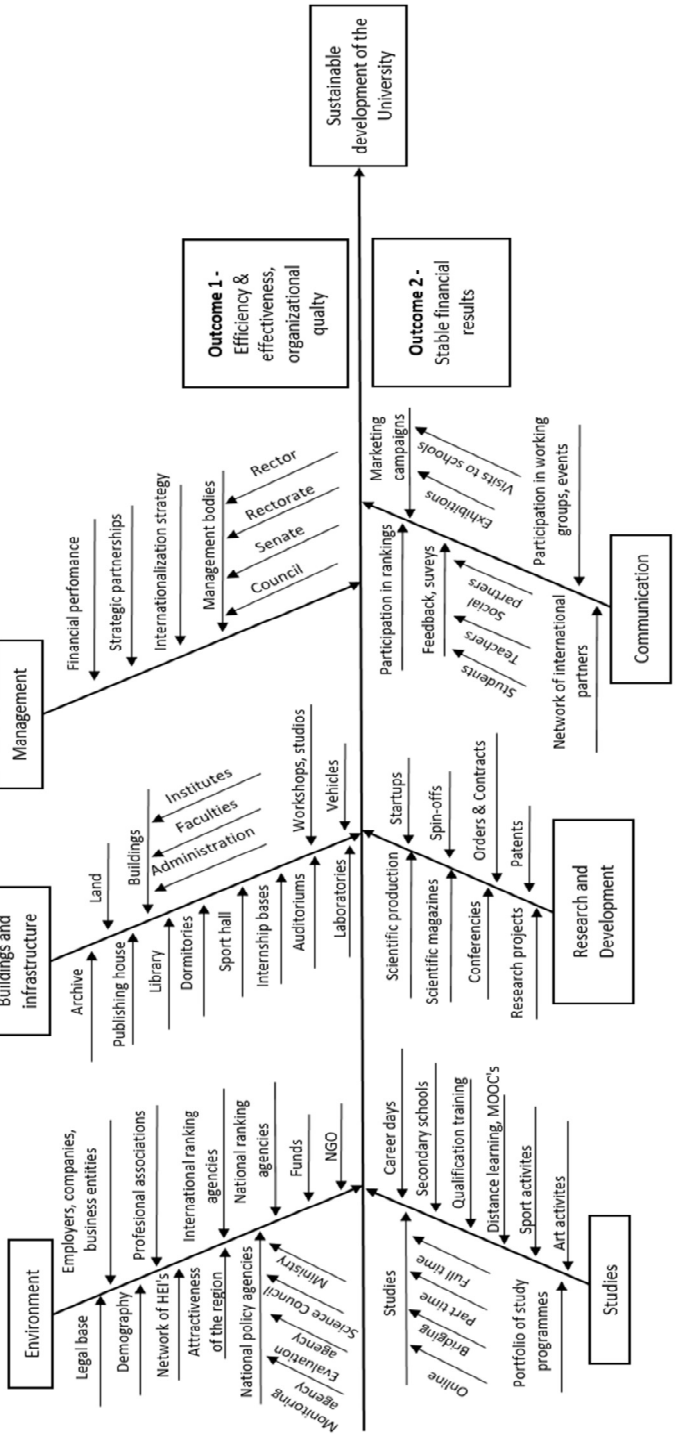

Fig. 2.2. The fishbone model for expression of the complexity of performance and activities of university. Composed by author based on Ishikawa, 1990

The generation and scientific approbation of new ideas, creating business startups. Internal and external stakeholders are also intertwined in this section.

The area of Communication could still be called a marketing strategy and is purposefully separated from other management strategies (partnerships, internationalization). It is the area that forms the image of the university for social stakeholders and society in general.

This part embraces marketing and public campaigns representing the university, visits to schools, enterprises, exhibitions, university involvement in different workgroups and networks, information and personal data systematization and submission to various rating agencies, international partnership networks, the management of feedback from students, teachers and social partners.

The area of Management consists of two components: the strategic documents and governing bodies of the university. Strategic documents cover visions, missions, long-term or medium-term strategies, annual plans of individual sectors, areas, divisions and their activities. The governing bodies include the University Council, the Senate, the Rector and its subordinate Rectorate. The governing bodies also include the representatives of external social partners. A trade union or student self-governing bodies (associations, representations) are not included as they are established on a voluntary basis and the university is not their founder.

The area of Infrastructure and buildings best reflects the assets the university has at its disposal in the course of activities. This is an area of exclusive activity and responsibility of internal stakeholders comprising land ownership or rent, multi-purpose buildings for studies, science, executives and students (hostels, catering, etc.)

The last area of the Environment is more related to the surroundings of the university. Thus, it is possible to start with the legal basis determining university activities, national institutions forming and supervising university activities, professional and employer associations, non-governmental organizations and public and private funds interested and involved in university activities. These are demographic trends, the national network of higher education institutions, international and national higher education rating agencies. The attractiveness of the location the university is situated, study conditions and social support.

The intricacy of university activities is shown in Figure 2.2 using Ishikawa's cause-effect diagram. It should be noted that the university does not act in isolation or independently of its surrounding partners (internal or external) in none of the six activities areas mentioned above. All areas are regulated or have links with these partners. Thus, Figure 2.2 discloses the management of university activities and resources and at the same time completes Figure 1.3 demonstrating the links and expectations of the university and its surrounding social partners. In this way, university activities listed in Figure 2.2 requires a proper management system and clear internal communication at all levels of management. It should be also

stressed that the challenges and problems of internal communication are not subject to the size of the organization. Insufficient communication can make difficulties (slow down) in university activities focused on achieving defined strategic goals and good economic activity. At the same time, the effects of inconsistent, untimely or inappropriate communication can mean a higher probability of error and a longer response time taking into account the needs of both internal and external stakeholders.

2.1.2. The Economic Evaluation of a University Activity's Comprehensiveness

The overall economic evaluation of a higher education institution's study process can be expressed as a complex measure $SPE^{Uk}{}_{\Delta tj}$ calculated over a selected time interval Δtj, which in the final stage can be expressed in monetary size. There index *Uk* indicate the selected higher education institution (HEI), which can be university, university of applied sciences, high shool or other.

The influence of other components for $SPE^{Uk}{}_{\Delta tj}$ can be represented as *n-ary* Cartegian product of the main important sets of composing measures:

$$SPE^{Uk}{}_{\Delta tj} = SP^{Uk}{}_{\Delta tj} \times R\&D^{Uk}{}_{\Delta tj} \times C^{Uk}{}_{\Delta tj} \times M^{Uk}{}_{\Delta tj} \times B\&I^{Uk}{}_{\Delta tj} \times E^{Uk}{}_{\Delta tj}, \qquad (2.1)$$

where × denotes Cartesian product; the set $SP^{Uk}{}_{\Delta tj}$ denote the investments in the study process of the HEI during time interval Δtj; the set $R\&D^{Uk}{}_{\Delta tj}$ denote the investments in research and development activities of the HEI during time interval Δtj; the set $C^{Uk}{}_{\Delta tj}$ – the investments in communication and public relations of the HEI during time interval Δtj; the $M^{Uk}{}_{\Delta tj}$ corresponds to investments in management and administrative services of the HEI during time interval Δtj; the set $B\&I^{Uk}{}_{\Delta tj}$ – the investments in buildings and infrastructure support of the HEI during time interval Δtj; and the set $E^{Uk}{}_{\Delta tj}$ – stands for "Environment" which is seen as surrounding context affected by stakeholders of the HEI during time interval Δtj.

Definition 2.1 by Kuratowski (Kuratowski, 1921): The Cartesian product $X \times Y$ between two sets X and Y is the set of all possible ordered pairs with first element from X and second element from Y:

$$X \times Y = \{(x, y) \mid x \in X \text{ and } y \in Y\}. \qquad (2.2)$$

Definition 2.2 by Kuratowski of n-ary Cartesian product: The Cartesian product can be generalized to the n-ary Cartesian product over n sets $X_1, ..., X_n$.

Now, all of these main sets can be detalised by influence factors, which became the main components of economic value. We would like to express such composition operator by * symbol, denoting that such set is composed as an aggregate of influencing components.

*Definition 2.3 of composition (aggregation) *: w*hen many partially transparent layers need to be composed together, it is worthwhile to consider the algebraic properties of compositing operators which are used. Specifically, the associativity and commutativity determine when repeated calculation can or cannot be avoided. Consider the case when we have four layers to blend to produce the final image: F = A×(B*(C*D)), where A, B, C, D are partially transparent image layers and "*" denotes a compositing operator (with the left layer on top of the right layer). If only layer C changes, we should find a way to avoid re-blending all of the layers when computing F.

The main elements from which we would like to expres such agregates are taken from the Fishbone model (Fig. 2.2). The set

$$SP^{Uk}{}_{\Delta tj} = *\{SP^{Uk}{}_{i,\Delta tj}\} \tag{2.3}$$

is expressed as a composition of sets i of factors, i = 1, 2, …, 8 the aggregate structure of study process is composed of 8 factors corresponding to the branch of investments for study support process from Fig. 2.2. The factors composing this set are the following: Portfolio of study programmes, types and forms of studies, career planning activities, distance learning and MOOC's, collaboration activities with secondary schools, qualification training, sport and art activities for students. The set

$$R\&D^{Uk}{}_{\Delta tj} = *\{R\&D^{Uk}{}_{i,\Delta tj}\} \tag{2.4}$$

is expressed as a composition of sets i of factors, for i = 1, 2, …, 7 composed of 7 factors. The factors composing this set are the following: Scientific production, magazines, conferences, projects. Startups and spin-offs, patents, orders and contracts from business, government, society. The set

$$C^{Uk}{}_{\Delta tj} = *\{C^{Uk}{}_{i,\Delta tj}\} \tag{2.5}$$

is expressed as a composition of sets i of factors, for i = 1, 2, …, 5 which is composed of 5 factors corresponding to the branch of communications from Fig. 2.2. The factors composing this set are the following: Feedback and surveys, a network of international partners, marketing campaigns, participation in working groups and events, participation in rankings. The set

$$M^{Uk}{}_{\Delta tj} = *\{M^{Uk}{}_{i,\Delta tj}\} \tag{2.6}$$

is expressed as a composition of sets i of factors, for i = 1, 2, …, 4 composed of 4 factors. The factors composing this set are the following: Management bodies, strategic partnerships, internationalization strategy, financial performance and results. The set

$$B\&I^{Uk}{}_{\Delta tj} = *\{B\&I^{Uk}{}_{i,\Delta tj}\} \tag{2.7}$$

is expressed as a composition of sets i of factors, for $i = 1, 2, \ldots, 12$ composed of 12 factors. The factors composing this set are the following: land, buildings, auditoriums, laboratories, studios, internship bases, sports facilities, dormitories, library, publishing house, archive and automobiles. The set

$$E^{Uk}{}_{\Delta tj} = *\{E^{Uk}{}_{i,\Delta tj}\} \tag{2.8}$$

is expressed as a composition of sets i of factors, for $i = 1, 2, \ldots, 11$ composed of 11 factors. The factors composing this set are the following: Legal base, demography, a network of HEI's, attractiveness of the region, national policy bodies, employers, professional associations, national and international ranking agencies, funds and NGO's. The goal for sustainable development (SD) of the HEI can be expressed as:

$$SPE^{Uk}{}_{\Delta tj} \rightarrow \text{Max the benefit forwarding efforts for SD}^{\,Uk}{}_{\Delta tj}. \tag{2.9}$$

The two interrelated outcomes are possible from this equation: (1) efficiency and effectiveness of organization (i.e. quality) and (2) stable financial results (i.e. benefit (profit)), and these two should lead the university towards sustainable economic development.

The proposed sets are not homogenous. The set $B\&I^{Uk}{}_{\Delta tj} = *\{B\&I^{Uk}{}_{i,\Delta tj}\}$, is seen as minimizing goal functions while others $SP^{Uk}{}_{\Delta tj} = *\{SP^{Uk}{}_{i,\Delta tj}\}$, and $R\&D^{Uk}{}_{\Delta tj} = *\{R\&D^{Uk}{}_{i,\Delta tj}\}$, are more maximizing goal functions. Despite the fact that set $C^{Uk}{}_{\Delta tj} = *\{C^{Uk}{}_{i,\Delta tj}\}$ is seen as expenses on the other hand it's maximizing $SP^{Uk}{}_{\Delta tj} = *\{SP^{Uk}{}_{i,\Delta tj}\}$, and $R\&D^{Uk}{}_{\Delta tj} = *\{R\&D^{Uk}{}_{i,\Delta tj}\}$ sets.

To assess the importance and significance of the study process in the overall activities of the university, the normative legal acts allocating state budget allocations to universities were introduced. Further analysis was carried out on the basis of the annual reports of the chosen university B from Lithuania (Fig. 2.3). The analysis of the data of B university revealed that during the period 2013–2018 the most substantial part of the state budget appropriations received consisted of funds allocated to the field of higher education studies. Higher education studies at the university B were accounted for about 7 times more funding than the area of Research and development.

The decrease of state budget allocations for higher education studies during the analyzed period is explained by the decreasing number of students every year. The importance of the field of higher education studies from the economic point of view is also confirmed by the structure of own resources (revenue from services rendered) by activity area. The higher education studies (i.e. study process) generated more than 50 per cent of own funds during the period of 2013–2018 (Fig. 2.4).

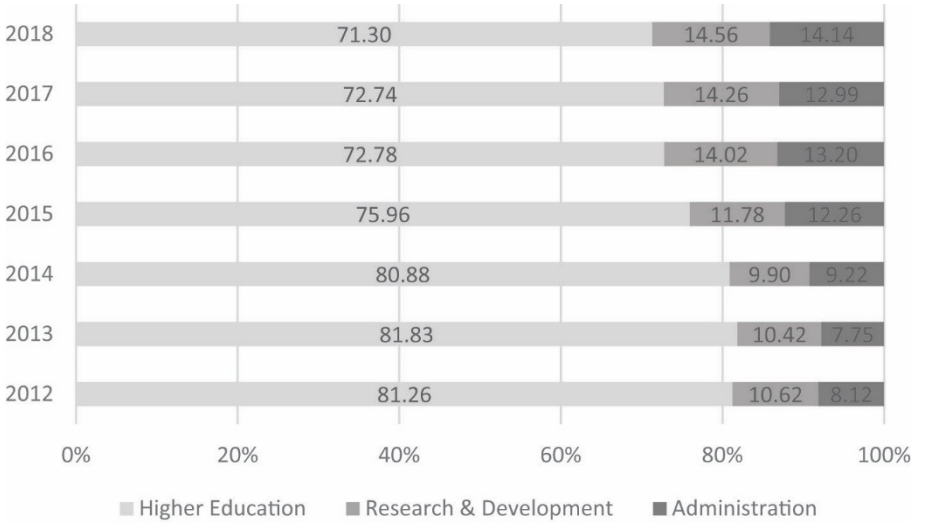

Fig. 2.3. State budget allocations to B university field of subject for 2013–2018 (%). Composed by the author based on B university annual report 2019

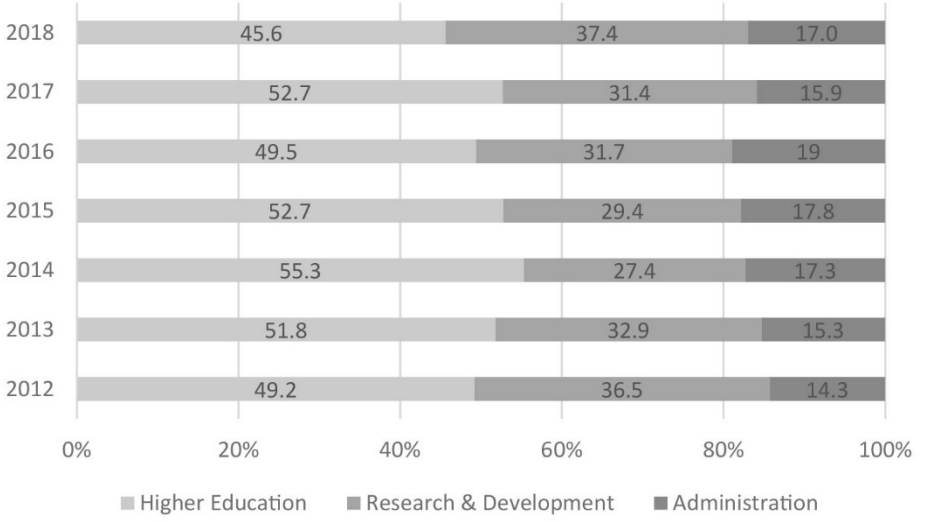

Fig. 2.4. Structure of funds received (attracted) by B university in 2012–2018 by area of subject (%). Composed by the author based on B university annual report 2019

These data show the importance of the study process in the economic activity of the university. The economic significance of the higher education studies (i.e. study process) for the university life presupposes a more detailed analysis of the elements that make up this process and their sustainable development.

For the deeper analysis of the university study process ($SP^{Uk}_{\Delta tj}$) provided the assessment of incomes and expenses related to this set.

Table 2.1. The incomes and expenses related to the Study process of the university (compiled by author)

	Name of criteria	Importance	Goal function	Measuring units
Incomes	State-funded study places	High	Max	EUR
	Tuition fees from the local students who did not receive state-funds	High	Max	EUR
	Entrance-admission fees	Low	Min	EUR
	Exam retake fees	Low	Min	EUR
	Mobility students from abroad for a fixed period of studies (ERASMUS+ or similar)	Low	Min	EUR
	Full-time students for full study programme from abroad	High	Max	EUR
	Qualification training courses (selective)	Low	Min	EUR
Expenses	Salaries for teaching academics	High	Max	EUR
	Salaries for studies administrative staff	High	Max	EUR
	Salaries for studies support staff	Low	Min	EUR
	Scholarships, grants and other allowances for students	High	Max	EUR
	Studies dissemination activities: • marketing expenses, • wages of admission staff, • organising and participating in career days	High	Max	EUR
	Study environment and resources: • buildings, • auditoriums, • laboratories • equipment	High	Max	EUR
	Portfolio of study programmes	Low	Min	EUR
	International mobility activities for students and teachers	Low	Min	EUR
	Sports and art activities for students	Low	Min	EUR

End of Table 2.1

	Name of criteria	Importance	Goal function	Measuring units
	Development of university campus: • housing facilities for students; • catering services	Low	Min	EUR
	Quality assurance activities	Low	Min	EUR
	Feedback from students	Low	Min	EUR
	Development of teachers pedagogical competences	Low	Min	EUR
	Development of MOOC's and online studies	Low	Min	EUR

These data illustrate and justify the importance of the study process of the university's activities and functions as a whole. The organization, fulfilment and activities of the study process require the most of the university's financial and other type resources. Since economic development is considered a long-term process of economic growth of a country, organization, or the company by the increase of quantitative economic indicators, therefore, when evaluating the importance of the study process in the activities of the university, it is necessary to ensure the measurement of the criteria forming this process with appropriate indicators.

2.1.3. The Analysis of Applying Standards and Guidelines for Quality Development of the Study Process

Following the analysis of the comprehensiveness of university activities for economic sustainability, it is expedient to revise the concepts of quality assurance and improvement described in sub-section 1.3.1 of the dissertation. Elassy (2015) points out a continuum between these concepts, but it is exactly quality assurance that performs a diagnostic role of quality. In other words, a lack of proper quality assessment may not ensure that the decisions made and implementation instruments selected by the university will help the institution with improvements in quality (Elassy, 2015).

The concept of quality in the context of higher education can be understood and analyzed in various ways. The constructs such as "quality assessment" (evaluation), "quality assurance", "quality control", "quality management", "quality auditing", "quality planning", "quality culture" (Vlăsceanu, Grünberg, & Pârlea, 2007) are available. In the case of actual university activities, they often interact with each other.

Quality assurance is a recurrent (continuous) assessment process that involves the evaluation (monitoring, assurance, support, improvement) of a programme, university or its unit (for example, faculty). The focus is put on two aspects: accountability and improvement providing information and a basis for decisions grounded on the assessment of the pre-agreed process and defined criteria. In practice, the most common distinction is made between internal (self-initiated) and external (associations, agencies) quality assurance, particularly in the cases when quality assurance is considered to be a prerequisite for the institution to obtain funding, be accredited or obtain other permission for performance (Vlăsceanu, Grünberg, & Pârlea, 2007).

The application of quality assurance in university activities is widely examined by scientific literature considering various aspects: quality assurance in the eyes of students (Law, 2010); (Narang, 2012), student inclusion (Elassy, 2013), improvement in quality (Poole, 2010), education management (Želvys, 2009), autonomy for and control over universities (Beerkens, 2011), external evaluation and restructuring universities (Haapakorpi, 2011), process management (Kettunen, 2012) and other aspects.

European Standards and Guidelines for Quality Assurance of for higher education (ESG) were developed by the Bologna Process and can be accepted as an integrated tool for universities to ensure the quality of studies (see Table 2.2). 2015 The updated version of ESG defines the following parts of internal quality assurance of university studies.

Table 2.2. Internal quality assurance of university study process based on European Standards and Guidelines for Quality Assurance (compiled by the author)

Chapter	Description	Key terms
1. Policy on quality assurance	Universities should have a publicly available quality assurance policy as a part of its strategic management. Internal stakeholders should develop and implement this policy through the established structures and processes, including external social actors	Quality assurance Continuous improvement Accountability Quality culture Stakeholders Processes
2. Design and approval of study programmes	Universities should follow the process of developing and validating study programmes that should be designed in such a way that they could achieve their objectives, including the intended learning outcomes. The qualifications provided by the programme should be	Study programmes Learning outcomes Study workload Approval of study programmes

Continued Table 2.2

Chapter	Description	Key terms
	clear, communicated and in line with the level of the defined national qualification framework as well as with the level of qualifications of the European Higher Education Area	
3. Student-centered learning, teaching and assessment	Universities should ensure that study programmes are conducted in a way that encourages students to take an active role in the learning process while the conducted student assessment reflects this approach	Students motivation Reflection Flexible learning paths Variety of teaching methods Self-studies (individual learning) Student appeal procedures
4. Student admission, progression, recognition and certification	Universities should prepare and publish rules covering all stages of the student cycle such as admission, the regulation of the learning path during the study, recognition, certification	Student admission (enrolment conditions) Introduction to studies and a study programme Progression Mobility Recognition and certification
5. Teaching staff	Universities should take care of their teacher competencies and should have a fair and transparent process of recruiting and improving their competences	Suitable teaching environment Competent teachers Transparency
6. Learning resources and student support	Universities should have adequate funding to provide teaching and learning activities and easily accessible learning resources and facilities	Library IT infrastructure (resources) Mentors Providing information
7. Information management	Universities should ensure the collection, analysis and use of appropriate information for the effective	Data collection Suitable indicators Student data

End of Table 2.2

Chapter	Description	Key terms
	management of their programs and other activities	Student satisfaction with studies Drop-out rates Career opportunities for graduates
8. Public information	Universities must make public information about their activities, including programmes, in a clear, objective, timely and easily accessible way	
9. On-going monitoring and a periodic review of programmes	Universities should periodically monitor and review their study programmes in order to ensure that they meet the set goals and student and society needs. The reviews should help with further improvement in the programmes. Any planned or performed action should be communicated publicly	Content of study programmes Changing needs of society Student workload Progression Recognition and certification Effectiveness of student evaluation Student expectations, needs and satisfaction with a study programme Learning environment
10. Cyclical external quality assurance	Universities should carry out periodical external quality assurance according to the ESG standards and guidelines	Ensuring the implementation of improvement after the external evaluation of the programme

The assessment of ESG provisions for the internal quality assurance of studies demonstrates it is purposeful to link them with the concept of sustainable development. Separate sections of ESG provisions, apart from keywords, contain a list of criteria for further empirical research.

After analysis of content, descriptions and key terms of internal quality assurance of study process based on ESG provisions the research focus was set on 7 main areas or thematic groups named: quality assurance policy, study programmes, students, teachers (academics), conditions of studies, study resources, information. According to process management philosophy the quality

assurance policy is considered as a strategic element of this process. Study programmes, students, teachers (academics) seen as key role players in implementation of this process. Rest elements such conditions of studies, study resources, information are concidered as supportive ones. The graphical visualisation is provided in Figure 2.5.

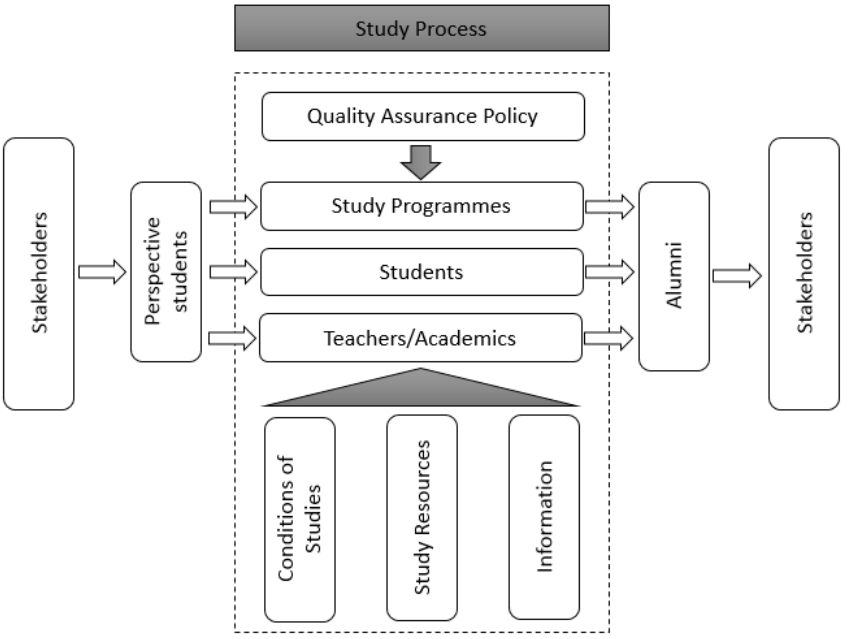

Fig. 2.5. The specification of university study process the content analysis areas of the (compiled by auhor)

Figure 2.5 also discloses the relationship between university study process and stakeholders surounding the university. It is also notable that approach to this process can be used by every higher education institution despite its type an mode of ownership.

The academic study process is one of the essential activities that the university must secure to achieve economic sustainability. That process is of highly detailed origin and seems with similar implementation in different universities at first glance. The study process is a permanent and dynamic process but of complex origin, as if confirmed by the teardown analysis of ESG provisions. That process comprises a wide range of subjects and criteria, some of which are difficult to measure quantitatively. However, the ESG guidelines have provided an opportunity to rearrange the university level study process in a systematic way for further assessment.

2.2. Identifying the Relationship between the Quality Assurance of the Study Process and the Concept of Sustainable Development

In order to establish the relationship between the quality of the studying process at the university and the dimensions of the concept of sustainable development, a targeted expert survey was conducted.

Figure 2.6 reveals the logic of the assessment of relationship between the quality of the Study Process at the university and the concept of Sustainable Development. Quality development of university study process while implementing ESG guidelines is an object. The study process at university level divided to 7 policy areas according to ESG guidelines. Every policy area is composed of number of criteria from 3 to 5. In the end, every of named criteria corresponds to dimensions of the sustainable development concept.

The method has been preferred taking into account expert evaluation that is one of scientific-practical disciplines obtaining knowledge from a person that can be regarded as an expert in a particular field. An expert is a specialist having knowledge and experience of a certain area. The term originates from the Latin word *exppertus* that means "experienced". Expert evaluation involves the systemic organization, coding and interpretation of certain knowledge and insights using logical and mathematical methods and is accepted as a general opinion of an expert group. At the same time, this is a procedure that allows making uniform the opinions of individual experts and making a joint decision (Lithuanian eGovernment Guidelines: Survey of Future Insights, 2009).

The expert rationally manages the information of a certain area, and therefore can be a source of qualitative information. In order to meet requirements for expert evaluation and to create algorithms for analysing procedures and obtained data, the methods for the measurement theory and mathematical statistics have been applied.

With reference to the conducted analysis of the internal quality of studies according to ESG provisions (Table 2.1) and the possible matrix of the relationship between the quality of the studying process at the university and the concept of sustainable development (see Figure 2.6), a questionnaire for the experts was prepared. Surveying tool SurveyMonkey assisted in preparing the questionnaire sent to the selected staff of Lithuanian and foreign universities. The universities operating in Lithuania made the largest share of respondents. The questionnaire was also provided for the representatives of the Universities operating abroad. For comparing data, the representatives from NOVIA University of Applied Sciences (Finland), Haaga-Helia University of Applied Sciences (Finland) and Tallinn

Technical University (Estonia), i.e. the place where the author completed a PhD traineeship, were selected.

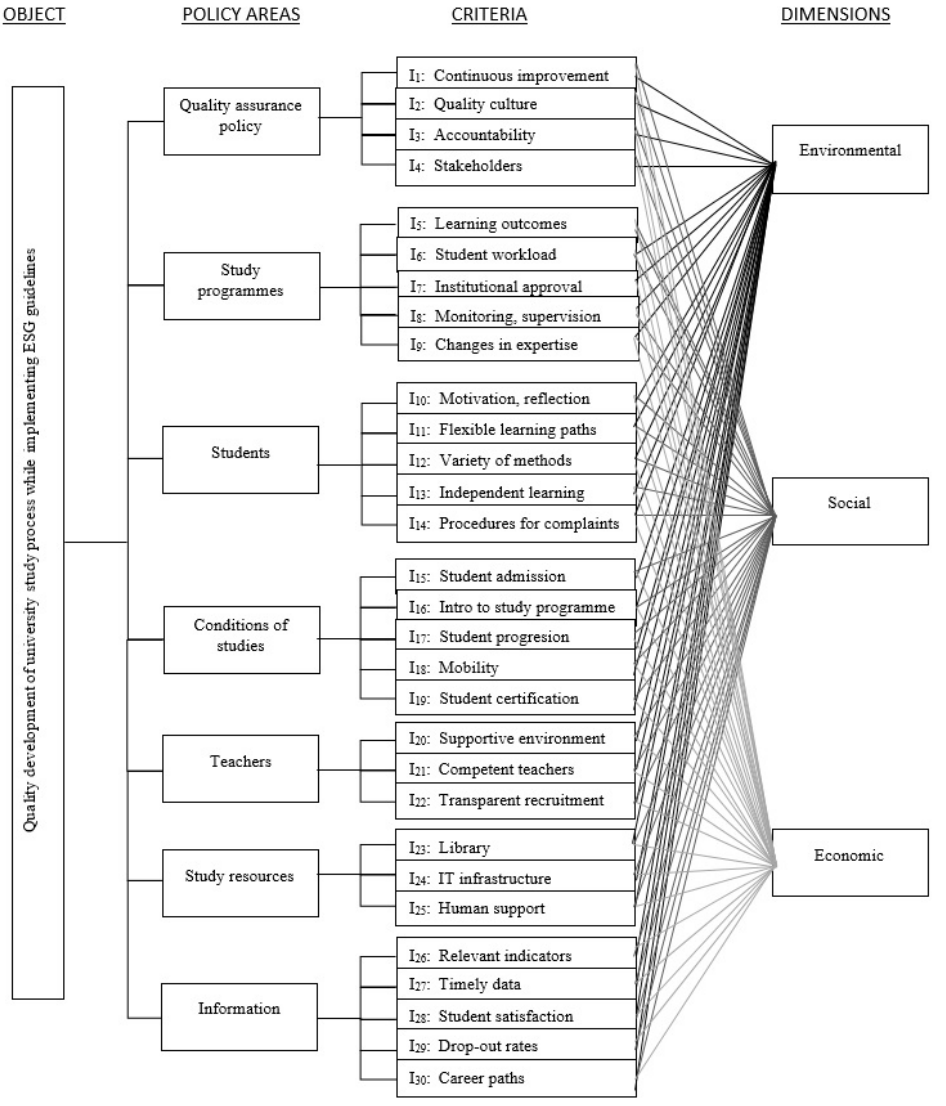

Fig. 2.6. The relationship between the quality of the study process at the university and the concept of Sustainable Development (compiled by auhor)

The group of the experts the opinion of which would be considered at the next stage of the survey was requested to indicate if they had a doctoral degree thus

specifying the year they had been awarded it. The respondents were further asked to indicate their position at the university. Available options included academic, administrative, academic and administrative (at the same time).

The experts were asked to indicate a pedagogical degree if they had one and to point out the length of time they had been working at the represented university regardless of their positions held.

In order to disclose the profile of the represented universities, the experts were asked to state whether the university they represented was the state or non-state owned one, to assign the represented university to the one of possible profiles (classical, technical, business school), to name the number of faculties or structural units having a status of the faculty and to indicate an approximate number of the students currently studying at the represented university.

On the basis of the gained experience and explanations provided, the experts were asked to attribute the listed quality criteria for the studying process at the university to one or several dimensions of the concept of sustainable development (economic, social, environmental). It was also possible to point out that the criterion was not attributable to any of the above dimensions if the expert considered it.

The groups of quality criteria for the studying process at the university are shown in Table 2.3. The dimensions of sustainable development are presented abbreviated in the table: E – economic, S – social, E – environmental.

Table 2.3. Policy areas and criteria of internal QA of university study process related to dimensions of the Concept of Sustainable Development (compiled by auhor)

Area	Criteria	Dimensions of the SD concept		
		E	S	A
1. Quality Assurance Policy	continuous improvement quality culture accountability stakeholders			
2. Study Programmes	learning outcomes student workload institutional approval monitoring and supervision changes in external expertise			
3. Students	motivation, reflection flexible learning paths			

End of Table 2.3

Area	Criteria	Dimensions of the SD concept		
		E	S	A
	variety of pedagogical methods independent learning procedures for student complaints			
4. Conditions for studies	student admission introduction to the programme student progression mobility student certification			
5. Teachers	supportive environment competent teachers transparent recruitment			
6. Study resources	library IT infrastructure human support			
7. Information	relevant indicators timely data student satisfaction drop-out rates career paths			

In the course of questioning the selected experts, 55 questionnaires were sent out 36 of which were filled in by the experts the data obtained by which were analyzed throughout the carried out research. Next, the generalized profile of the selected experts was provided. 29 of 36 experts (82%) had a PhD degree. 20 experts (57%) held academic, 10 (29%) – academic and administrative and 5 (14%) – administrative positions at the university. 18 respondents (51%) had a pedagogical degree of associate professor, 11 (31%) were lecturers and 5 (14%) were awarded a professor's pedagogical degree.

The surveyed respondents were evenly distributed according to the duration of their work at the university. 33 respondents (94%) worked at state and 2 (6%) – at non-state universities. 31 respondents (88%) represented technical while the other 4 (12%) – a classical university or a business school. The experts filled in the questionnaire and assigned the provided quality criteria for the studying process at the university to one or several dimensions of the concept of sustainable development.

The analysis of the obtained data allows presenting expert understanding of which criteria making quality groups (quality assurance policy, study programmes, students, study conditions, teaching staff, study resources, information) and distinguished within the studying process are most in line with the economic dimension of the concept of sustainable development.

The assessment of criterion groups and criteria making the groups presented in Table 2.3 demonstrates that most of them are attributed to the qualitative type of criteria for measuring and determining weight significance of which expert evaluation is the best option.

The summarized results of the conducted survey show that the experts evaluated criteria for every group and attributed the majority of those to each of the three dimensions of sustainable development.

Focus on economic dimension points to the following results obtained. The experts have identified criteria for accountability and continuous improvement in the group of criteria for quality assurance policy. The criteria related to the economic dimension of sustainable development have been cited by 75.76% and 74.29% of the respondents respectively. The criteria making the group of study programmes have counted approximately a similar number of choices, i.e. half of the surveyed experts indicate that all criteria attributed to this group may be related to the economic dimension of sustainable development. Analogous results have been obtained analysing criteria making the group of students. Meanwhile, criteria for study conditions have been found as more interrelated and reflecting economic dimension. The experts have acknowledged the following criteria related to this dimension: graduation (75.76%), admission conditions (72.73%) and mobility (69.70%). As for the group of criteria for teachers, the experts have agreed that all three criteria are related to the economic dimension of sustainable development in the following way: transparent recruitment (78.79%), appropriate teaching staff (72.73%) and adequate environment (68.75%). The experts have examined the group of study resources and singled out criteria for IT infrastructure and library making 79.41% and 73.53%respectively. Taking into account the group of information management, the experts have identified career opportunities (82.35%), timely data (74.29%) and student dropouts (67.65%) as the criteria most appropriate for the economic dimension of sustainable university development.

2.3. The Theoretical Simulation of the Comprehensive Assessment of the Quality of University Studies Using the Multi-Criteria Decision-Making Method

2.3.1. Selecting the Multi-Criteria Decision-Making Method

The application of decision-making methods in economics is revealed in a number of articles (Zavadskas & Turskis, 2011), (Velasquez & Hester, 2013), (Mardani et al., 2015). The Analytical Hierarchy Process (AHP) is a decision-making method developed by Saaty (1980) for solving complex problems of multiple criteria (quantitative and qualitative). The AHP technique involves the establishment of a hierarchy of evaluation criteria, assigning relative weights to the defined criteria, comparing alternatives to each criterion and a compilation of the aggregate ratings of all alternatives. The AHP technique provides the structured decision-making method based on the hierarchical approach to the solutions for pairwise comparison alternatives (Ngai & Chan, 2005).

The AHP technique is based on the defined structure of mathematical matrices using the method contrasting factors with reference to pairwise comparison. The application of this technique starts with a comparison of the groups of criteria and the pairwise comparison of the elements of these groups. These comparisons are intended to indicate the relative advantage of one criterion over the other. Individual significance applies to the made assessment and is obtained using the scale of relationships thus determining the dominance of one factor in relation to another employing expert evaluation. This method is more suitable for a large number of evaluators. The mathematical reasoning of the AHP technique provides the basis for greater objectivity.

The AHP technique and its application is widely described in the scientific papers prepared by Lithuanian (Grybaite & Tvaronavičiene, 2008); (Ginevičius & Podvezko, 2009); (Tupenaite, Zavadskas, Kaklauskas, Turskis, & Seniut, 2010); (Medineckiene, Turskis, Zavadskas, & Tamošaitiene, 2010); (Sivilevičius & Maskeliunaite, 2010); (Zavadskas & Turskis, 2011); (Brauers, Ginevičius, & Podvezko, 2012) and foreign (Saaty 1994; Millet 1998; Ruf, Muralidhar & Paul, 1998; (Stein & Ahmad, 2009) authors.

Opting for the AHP technique has been also determined by its common characteristics compared to other multi-criteria evaluation methods. The AHP technique uses group decision-making with reference to the arithmetic mean, the structure of the task is hierarchical, the compatibility of estimates is assured, qualitative

criteria may be quantitatively evaluated, different criterion measurement dimensions are employed, the method is moderately complex and has average labour costs of being applied (Poškas, Poškas, Sirvydas, & Šimonis, 2012).

It is worth noting that taking into account all methods for analysing multi-criteria evaluation, only the AHP technique uses the hierarchical structure of the task, which allows the examined problem to be split into smaller and clearer parts thus making it easier to consider. This is particularly important for analysing the intricate problems of multi-criteria decision-making. The preferred method also ensures the compatibility of the estimates of expert evaluation (i.e. whether evaluation is logical) or indicates the level of incompatibility that can be tolerated to a certain extent and does not affect the final assessment of the quality of the studying process at the university.

2.3.2. Determining the Significance of the Study Process Criteria Using the AHP Method

In order to achieve university activities for economic sustainability and to perform a more accurate assessment of the quality assurance system for the studying process and to solve the problem of quality improvement, it is necessary to determine the significance of both factors in the quality assurance system for the studying process and partial factors forming them (see Table 2.4).

Table 2.4. Specifying the content of factors (areas) and partial factors (criteria) creating the system for ensuring the quality of the studying process (compiled by auhor)

Areas (thematic groups)		Criteria (sub-factors)	
Quality assurance policy	D_1	continuous improvement	I_1
		quality culture	I_2
		accountability	I_3
		stakeholders	I_4
Study programmes	D_2	learning outcomes	I_5
		student workload	I_6
		institutional approval	I_7
		monitoring and supervision	I_8
		changes in external expertise	I_9
Students	D_3	motivation, reflection	I_{10}
		flexible learning paths	I_{11}
		variety of pedagogical methods	I_{12}
		independent learning	I_{13}
		procedures for student complaints	I_{14}

End of Table 2.4

Areas (thematic groups)		Criteria (sub-factors)	
Conditions for studies		student admission	I_{15}
		introduction to the programme	I_{16}
		student progression	I_{17}
		mobility	I_{18}
		student certification	I_{19}
Teachers	D_5	supportive environment	I_{20}
		competent teachers	I_{21}
		transparent recruitment	I_{22}
Study resources	D_6	library	I_{23}
		IT infrastructure	I_{24}
		human support	I_{25}
Information	D_7	relevant indicators	I_{26}
		timely data	I_{27}
		student satisfaction	I_{28}
		drop-out rates	I_{29}
		career paths	I_{30}

Bearing in mind that a part of the criteria forming the quality assurance system are of qualitative origin, expert evaluation has been chosen as the most appropriate way to determine the significance of the criteria (Ginevičius, 2006, Slapikaitė, 2017). It is therefore important that the proposed method will make it possible to establish the significance of the criteria in relation to each other and in terms of the defined goal, which is the quality assurance system for the studying process.

Although expert evaluation is criticized for the reliability of the obtained results determined by the subjectivity characteristic of the experts, it appears as one of the instruments for quantitatively assessing immeasurable phenomena and is applied more and more frequently in various fields (Rakauskienė 2013). The simplest methods for determining significance cover ranking or direct evaluation. In the case of ranking, the experts give ranks to the factor considering importance. Equivalent factors are given an equal value – the arithmetic mean of the ranked queues. The method is more appropriate when the significance of the factors does not have a strong impact on evaluation results, for establishing the compatibility of expert opinions on evaluation and for calculating the concordance coefficient (Podvezko 2005, 2007, 2008); (Rakauskienė 2013).

In the case of a small number of factors, direct assessment is more suitable because the experts directly indicate the significance of the factors for the parts of the unit (Ginevičius 2006). For applying this method, the sum of the significances

of all evaluations made by an individual expert must be equal to 1 (Ginevičius, Podvezko 2004; Podvezko 2008).

The issues of the theoretical and practical application of expert methods were considered in the research papers of many scientists (Бешелев, Гурвич 1980); (Andriušaitienė, Šleika, & Ginevičienė, 2008); (Ginevičius & Podvezko, 2008); (Saaty & Islam 2015). In recent years, a number of works on the use of fuzzy numbers for multi-criteria evaluation have appeared. In this area, particular attention is paid to assessing the significance of indicators employing the Fuzzy AHP technique (Chou, Sun, & Yen, 2012); (Samvedi, Jain, & Chan, 2012); (Samvedi, Jain, & Chan, 2013); (Zhü, 2014). As for this work, to assess the significance of indicators, the AHP (Analytic Hierarchy Process) technique based on the pairwise comparison matrices filled in by the experts has been preferred. This method was described by T. Saaty in 1980 (Saaty, 1980). The selection of this technique is determined by the fact that the significance of the indicator points out expert's opinion on the importance of the indicator when choosing the best alternative from the list of the options under consideration.

The defined certain significance of criteria describing the factor will disclose to what extent its significance for that factor is higher or lower compared to other partial factors.

The pairwise comparison method is an effective instrument, because a person can compare two indicators between each other. To determine the values of the significance of indicators, pairwise comparison questionnaires (tables) are filled in. To establish the priority of one indicator over the others, the scale of significances proposed by T. Saaty (Saaty, 1977); (Jakučionis & Ustinovičius, 2000) has been used.

The essence of the pairwise comparison method is that at the same time the expert compares only two of the criteria (Karbauskaite, Kurasova, & Dzemyda, 2007). As for the expert pairwise comparison method, the above-mentioned experts E_k, $k = 1, ..., 16$, in each area D_m, $m = 1, ...,7$, compare two criteria I_j, $j = 1, ..., 30$, between each other. Pairwise comparison is done applying to the principle of scales thus determining how much one criterion is more important than the other. In 1977, Saaty introduced a scale of criterion significance (see Table 2.5) used for prioritizing one criteria over the other.

Expert pairwise comparison questionnaires (tables) of indicators are filled in employing the following principle: an indicator in a line is compared to the indicators in the column. If the indicator in the line is more important than that in the column, an integer indicating the level of importance is written. If the indicator in the line is less important than the one in the column, the box of the questionnaire will contain a reverse number. Table 2.6 shows an example of the completed ex-

pert pairwise comparison questionnaire providing that the first and second indicators are equally important, the third indicator is more important than the first one, and the second indicator is slightly more important than the third one.

Table 2.5. The fundamental scale of absolute numbers (*source:* Satty, 1980)

Intensity of importance	Definition	Explanation
1	Equal importance	Two criteria contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgement slightly favour one criterion over another
4	Moderate plus	
5	Strong importance	Experience and judgement strongly favour one criterion over another
6	Strong plus	
7	Very strong or demonstrated importance	A criterion is favoured very strongly over another; its dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favouring one criterion over another is of the highest possible order of affirmation

Experts fill in the pairwise comparison tables of criteria comparing indicators in the lines with those in the column. If the criterion in the line is more important than that in the column, an integer indicating the level of importance is written. Template of experts questionnaire provided in Annex A.

If the criterion in the line is less important than that in the column, the box of the questionnaire contains a reverse number. When criteria are of equal importance, evaluation equals 1. Every expert evaluates $n\ (n-1)/2$ pairs, where n is the number of criteria. When applying the pairwise comparison method, the number of the compared criteria should not exceed 11, and even better, if the number of criteria should be less than 9, because it is difficult for a person to compare a larger number of criteria (Podvezko, 2009). As an example, the pairwise comparison table filled in by expert E_1 is given below, contains criteria I_1, I_2, I_3, I_4 (continuous improvement, quality culture, accountability and social partners respectively) and represents field D_1 (quality assurance policy).

Thus, for example, it can be noticed that I_1 is more important than I_4, slightly more important than I_3 and more important than I_1. I_2 is more important than I_1 and

much more important than I_3 and I_4. I_3 is slightly more important than I_4 (see Table 2.6).

Table 2.6. The pairwise comparison of criteria I_1, I_2, I_3, I_4 assigned by E_1 (*source*: Satty, 1980)

D_1	I_1	I_2	I_3	I_4
I_1	1	1/5	3	5
I_2	5	1	9	9
I_3	1/3	1/9	1	3
I_4	1/5	1/9	1/3	1

This is the principle experts E_k, $k = 1, 2, ..., 16$ referred to fill in the pairwise comparison tables in each of 7 areas. The tables of criteria completed by the experts further assist in calculating the values of criterion significance.

The core of the method is that a comparison of criteria in terms of each other is required for expert evaluation indicating whether the previous criterion is more or less important than the second one. The result of the performed comparison makes a hierarchical, the so called network, structure where all criteria are interrelated and evaluated with each other in relation to the problem under consideration (Saaty, Sagir 2009).

Mathematically, this derivative is expressed as a square matrix where $P = [p_{ij}]$, $i, j = 1, 2, ..., n$. Symbol n is the number of factors, p_{ij} denotes the ratio of the ranks of the i-th and j-th criteria provided by the k-th expert. The findings of the pairwise comparison of criteria given in the table are inserted into matrix P having the following expression:

$$P = \begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1n} \\ p_{21} & p_{22} & \cdots & p_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ p_{n1} & p_{n2} & \cdots & p_{nn} \end{bmatrix} = \begin{bmatrix} \frac{w_1}{w_1} & \frac{w_1}{w_2} & \cdots & \frac{w_1}{w_n} \\ \frac{w_2}{w_1} & \frac{w_2}{w_2} & \cdots & \frac{w_2}{w_n} \\ \vdots & \vdots & \cdots & \vdots \\ \frac{w_n}{w_1} & \frac{w_n}{w_2} & \cdots & \frac{w_n}{w_n} \end{bmatrix}. \tag{2.10}$$

The analysis of the methods for determining the significance of factors (Saaty 2005, 2008; Zavadskas et al. 2001; Ginevicius and Podvezko 2004, 2005, 2009; Ginevicius 2006; Podvezko 2008, 2009; Zavadskas and Turskis 2011; Rakauskiene 2013) demonstrates that expert evaluation is the basis for identifying the level of significance.

The most important factor will have the highest significance, and the total amount of significances will be equal to 1:

$$\sum_{j=1}^{n} W_j = 1. \tag{2.11}$$

This is component structuring into the hierarchy considering the importance of components (Saaty, 1994). The more thoroughly the expert looks into the analyzed system, the more accurate predictions and decisions will be. The method theory is based on human thinking. When faced with most of the controlled and uncontrolled elements creating a complex situation, the human mind connects them to groups. The hierarchy system is developed to make a decision and consists of several levels, each of which contains the corresponding elements, i.e. criteria. Due to a different effect of criteria, the need to determine the intensity of influence and the importance of criteria also referred to as the weights of criteria has appeared. The weights of criteria reflect the opinion of experts-evaluators on the importance of criteria compared to other criteria (Zhang & Yang, 2002); (Gupta & Nukala, 2005); (Lin, 2013).

2.4. The Sequence of the Application of AHP Method

According to the same manner, all E_k made decisions on pairwise comparison tables. Every expert made the pairwise comparison of criteria in 7 areas, and therefore 112 pairwise comparison tables were constructed in total. Since all criteria are pairwise compared, the determination of the generalized weight (significance) of the criteria could be performed. Hence, the following sequence should be implemented.

To create pairwise comparison matrices $P_m^{(k)} = (p_{ij}^{(k)})$, where p_{ij}, $i, j = 1, ..., n$, denote the pairwise comparison of criteria I_i and I_j . Recall that k and m denote, respectively, the number of expert E_k, $k = 1, ..., 16$, and area D_m , $m = 1, ..., 7$, where n – the total number of criteria in the relative area, p_{ij} is the ratio of the ith and jth ranks assigned by the kth expert.

Clearly, the considered instant elements of pairwise comparison matrices are coincident with the elements of pairwise comparison tables.

Let us note, that $p_{ii}^{(k)} = 1$ and $P_m^{(k)}$ is an inverse symmetrical matrix, i.e. $p_{ij}^{(k)} = 1 / p_{ji}^{(k)}$. The number of the non-recurrent elements of the nth-order matrix $P_m^{(k)}$, i.e. the number of the elements compared, is $n(n - 1)/2$ (the total number of the elements of the comparison matrix is equal to n^2).

Hence, for larger *n*, the task of comparison becomes more tedious and time-consuming. Moreover, as provided by (Mazurek and Perzina 2017), the human brain is capable of processing only up to 7 pieces of information at the same time. This indicates that the more criteria are compared, the more inconsistent these comparisons will be. Nevertheless, the proof for this claim is missing as there are no studies known to the authors investigating the issue.

To ensure the consistency of pairwise comparison matrix $P_m^{(k)}$. The necessary condition for the consistency of the comparison matrix is the transitivity of the significance of the elements of matrix $P_m^{(k)}$. In the ideal case, the following equalities are satisfied:

$$P_m^{(k)} q_m^{(k)} = n q_m^{(k)}, \tag{2.12}$$

where $q_m^{(k)} = (q_{m,1}^{(k)}, ..., q_{m,n}^{(k)})^T$ are an eigenvector of $P_m^{(k)}$. It is a well-known mathematical problem of eigenvalues and eigenvectors:

$$P_m^{(k)} q_m^{(k)} = \lambda_m^{(k)} q_m^{(k)}, \tag{2.13}$$

where $\lambda_m^{(k)} = n$ is an eigenvalue of matrix $P_m^{(k)}$, and n is the number of the criteria to be compared.

As mentioned in (Saaty 1980, 1990, 2008; Ginevičius et al. 2004; Podvezko 2009), the AHP method is aimed at determining the weights of criteria and assessing the consistency of questionnaires elicited from the experts. For this purpose, a complicated practical eigenvalue problem should be solved as follows.

First of all, let's create normalized decision-making matrix $B_m^{(k)} = (b_{ij}^{(k)})$, where

$$b_{ij}^{(k)} = \frac{p_{ij}^{(k)}}{\sum_{i=1}^{n} p_{ij}^{(k)}}. \tag{2.14}$$

Find the largest eigenvalue of $P_m^{(k)}$. The problem of eigenvalues and eigenvectors is difficult to solve manually, and thus we calculate the approximate values of eigenvectors and respective largest eigenvalues. We calculate the eigenvector as the weight (significance) of criteria,

$$q_{m,i}^{(k)} = \frac{1}{n} \sum_{j=1}^{n} b_{ij}^{(k)}, \qquad i = \overline{1, n}. \tag{2.15}$$

Let's remark, that the higher is the value of $q_{m,i}^{(k)}$, the higher is the importance of criterion I_i. The use of (2.12) and (2.14) gives the approximate values of $\lambda_m^{(k)} = \left(\lambda_{m,1}^{(k)}, ..., \lambda_{m,n}^{(k)}\right)$.

It is known (see, e.g. Satty 1990) that the largest eigenvalue of the inverse symmetrical *n*th-order matrix is $\lambda_{\max}^{(k)} \geq n$. In the ideal case, when the matrix is absolutely consistent and the elements of the columns are proportional, $\lambda_{\max}^{(k)} = n$. Accordingly, in this case, the calculated values $\lambda_m^{(k)} = \left(\lambda_{m,1}^{(k)}, ..., \lambda_{m,n}^{(k)}\right)$ must be equal to *n*. If all values $\lambda_{m,i}^{(k)}$ differ, then, approximately

$$\lambda_{\max}^{(k)} = \frac{1}{n}\sum_{i=1}^{n}\lambda_{m,i}^{(k)}. \tag{2.16}$$

For consistency index $S_I^{(k)}$ of $P_m^{(k)}$, we adopt values (see, e.g. Satty 1990)

$$S_I^{(k)} = \frac{\lambda_{\max}^{(k)} - n}{n-1}. \tag{2.17}$$

It is the negative averages of the other roots of the characteristic polynomials of $P_m^{(k)}$. The smaller is the consistency index, the higher is the consistency of the pairwise comparison matrix. In the ideal case, $S_I^{(k)} = 0$. Now, let's calculate the degree of consistency

$$S_m^{(k)} = \frac{S_I^{(k)}}{S_A}, \tag{2.18}$$

where random consistency index S_A is given in Table 2.7.

Table 2.7. The values of random consistency index S_A (s*ource:* Saaty, 2008)

n	1	2	3	4	5	6	7	8	9	10	11	12
S_A	0	0	0.52	0.89	1.11	1.25	1.35	1.40	1.45	1.49	1.52	1.54

Let us note, that $P_m^{(k)}$ is consistent if $S_m^{(k)} \leq 10\%$ is acceptable. In another case, an expert is asked to revise his/her judgments. Otherwise, the created pairwise comparison matrix cannot be used for further investigations. However, this rule was criticized by some authors, see e.g. (Koczkodaj, 1993). In the ideal case,

$S_m^{(k)} = 0$. For information on how the inconsistency of pairwise comparison in the AHP framework changes when the number of the criterion to be compared increases, see e.g. (Mazurek and Perzina 2017).

To test the consistencies of expert judgments. Considering the results above, it is significant to determine the consistencies of expert judgments. Thus, Kendall's coefficient of concordance W_m (Kendall & Smith, 1940). The following calculation scheme is suggested.

Calculating the sum of the deviations from the squares of criterion ranks from the averages of criterion ranks:

$$Z_m = \sum_{j=1}^{n}\left(\sum_{k=1}^{r} c_{m,j}^{(k)} - a^2\right)^2, \qquad a = \frac{1}{n}\sum_{j=1}^{n}\sum_{k=1}^{r} c_{m,j}^{(k)}, \tag{2.19}$$

where $c_{m,j}^{(k)}$ is the rank of the j*th* criterion in the *m*th area for the *k*th expert.

Ranking is a procedure when the highest rank equal to 1 is devoted to the most important criterion (with the highest weight), the second rank is devoted next to the most important criterion, etc.

Kendall's coefficient of concordance is calculated according to the formula:

$$W_m = \frac{12Z_m}{m^2(n^3 - n)}. \tag{2.20}$$

If the judgments of the experts are consistent $W_m = 1$, otherwise $W_m = 0$. In order to determine the significance of the concordance coefficient, the further hypothesis should be tested:

H_0: the judgments of the experts are inconsistent ($W_m = 0$); H_1: the judgments of the experts are consistent ($W_m > 0$).

It was proved by Kendall that if the number of criteria is $n > 7$, then, the significance of the concordance coefficient could be determined with the help of criteria χ^2, as the random variable is distributed according to χ^2 – distribution with $\nu = n - 1$ degrees of freedom. The significance of concordance coefficient W_m is performed by comparing $\overline{\chi}_m{}^2$ with critical values $\chi^2_{\alpha,\nu}$ from chi-squared distribution with ν degrees of freedom and selected confidence level α. If $\chi^2_m > \chi^2_{0.05;\nu}$, then, H_0 is rejected, which means that the dependence between the judgments of the experts exists. Let's note, that if $3 < n \leq 7$, then, the distribution of χ^2 must be applied choicely, as in the case where $\overline{\chi}_m{}^2 \leq \overline{\chi}^2_{\alpha,\nu}$, the judgments of the experts may be consistent. In this instance, critical values $S_{\alpha,n}$ from the table of those of

Kendall's coefficient of concordance (Friedman 1940) are compared with Z_m values. If $Z_m > S_{\alpha,n}$, then, H_0 is rejected.

$$\bar{\chi}_m^2 = W_m r(n-1) = \frac{12Z_m}{rn(n+1)}. \tag{2.21}$$

To calculate general weights. If the judgments of the experts are consistent, then, conclusions about the significance of the criteria should be performed by calculating general weights, i.e. the average of (2.13):

$$\bar{q}_{m,i} = \frac{1}{n}\sum_{k=1}^{r} q_{m,i}^{(k)}, \qquad i = \overline{1,n}. \tag{2.22}$$

The higher is the value of (2.21), the higher is the importance of criterion I_i.

2.5. Conclusions of Chapter 2

1. This chapter uses the logic of the Cause and effect diagram of Ishikava's method to demonstrate the intricacy of analysing university activities. Assessment of the versatility and intricacy of university activities and the further analysis of the opportunities for the sustainable economy of the university has led to a narrowing of the research object to the studying process at the university, which is one of the main processes of university activities.
2. The analysis of the possibility for the studying process at the university to have an effect on the economic sustainable development of the university included assessing whether European Standards and Guidelines for Quality Assurance could be applied to advance the studying process. The results of an expert survey comfirmed the relationship between the quality of the studying process at the university and the dimensions of sustainable development.
3. The results of the survey provide the basis for using the multi-criteria evaluation method to carry out the following theoretical simulation of the intricate assessment of the quality of university studies.The analysis of multi-criteria evaluation methods points to the analytical hierarchy process (AHP) technique that was selected for research purposes. The choice was determined by the universal hierarchy of the technique, unlike other multi-criteria evaluation methods.
4. In view of the qualitative nature of a part of the examined criteria for the quality assurance system, expert evaluation is the most appropriate

way to define the significance of criteria that constitutes the system. The sequence and reasoning of the steps in employing the AHP method has been prepared to determine the significance of criteria that constitutes the quality system for university studies.

3

Empirical Research of the Study Process Importance to the University Economic Sustainability

This chapter reveals the results of empirical research of the proposed method conducted in three universities to assess the quality of the university study process. The developed method is tested while performing research in selected Lithuanian and foreign universities. Based on the results of the research the list of criteria that were emphasized as the most important ones by the experts was discussed. The proposed list of indicators that measures the pointed out criteria of the quality of the study process comes next. These findings in common serve as a basis for further discussion in emphasizing the quality assurance significance to the search of purposefully pursue sustainable economic development of university.

The findings of this chapter were published in the scientific articles by Labanauskis, Kasparavičiūtė, Davidavičienė, Deltuvienė, 2018; Labanauskis, Kasparavičiūtė 2019.

3.1. Evaluation of Importance of Criteria that Composes Quality of the University Study Process by AHP Method

As mentioned by Mazurek and Perzina, (2017) pairwise comparison as a tool for decision making or measurement was considered in the research works from the end of 18th century or even earlier. For the first time, the theory of pairwise comparison was provided by L. L. Thurstone in 1927. The methods of pairwise comparison were often criticized as too sophisticated; however, they had an excellent mathematical basis. Since the early 1980s, pairwise comparison has become the central point of the analytic hierarchy process (AHP) and the analytic network process (ANP) introduced by T. L. Saaty along with his fundamental scale for pairwise comparison ranging from 1 to 9 (Saaty, 1980, 1990 and 2008). The AHP/ANP proved to be a useful tool in many areas of human action involving multiple criteria decision making such as economics, management and marketing, construction, medicine, politics, environmental protection, etc. An overview of AHP applications can be found in a number of works (for references see, e.g. (Mazurek & Perzina, 2017).

This work uses the AHP (Analytic Hierarchy Process) for evaluating the significance of the criteria and is based on the expert-filled dual matrix comparison. This method was described by T. Saaty in 1980 (Saaty, 1980). The choice of the method is conditioned by the fact that the significance of the indicator shows the expert opinion on the importance of the indicator for choosing the best alternative from the list of the alternatives under consideration. The components are hierarchically structured depending on their importance (Saaty, 1993). The more depth an expert puts into the analyzed system, the more accurate the forecasts and decisions will be. The theory of the method is based on human thinking. Faced with most of the controlled and uncontrolled elements that make up a difficult situation, the human mind attributes them to groups. The hierarchical system is developed to make a decision and involves several levels each of which is made of corresponding elements, i.e. criteria. Due to an uneven effect of the criteria, there was a need to determine the intensity of the impact and the importance of the criteria also known as weighting the criteria reflecting the opinion of expert evaluators on the importance of the criteria in comparison with other criteria (Zhang & Yang, 2002); (Gupta & Nukala, 2005); (Lin, 2013).

Succeeding the analysis of the scientific papers devoted to the concept of quality assurance described in the theoretical part and in order to analyse the study process at the university level in a more detailed way from the qualitative approach, the following methodology has been chosen. At the first stage of the research, a questionnaire of pairwise criteria for the study process at the university level

was prepared, which was done taking into account the concept of the quality assurance of internal studies according to ESG and the analysis of multi-criteria evaluation methods. The criteria for the study process at the university level I_j, $j = 1, 2, ..., 30$ were divided into thematic groups D_m, $m = 1, 2, ..., 7$ each of which comprised 3 to 5 criteria.

Conducting a precise assessment of the quality assurance system at the university level is necessary for determining the significance of the components of the quality assurance system of the study process and criteria that make up them. A set of the specific criteria describing the significance of the thematic group will reveal its importance, i.e. how much the criteria are higher or lower compared with other criteria.

As for the second part of the research, the survey of experts E_k, $k = 1, 2, ..., 16$ was conducted in February–September 2018. The experts from two universities in Lithuania, including (A) and (B), as well as experts form university in Finland (C) participated in the performed examination. The group of experts was extended to avoid possible inconsistency rations. The selected experts were university representatives holding a doctorate degree and having academic and administrative experience at the university. The expert group consisted of the present and former Deans and Vice-Deans of the faculties, Professors and the Heads of study programmes. The participants were professionals in their fields and developed and implemented the study process at the universities their represented. For expert selection, gender equality was taken into consideration.

Following the research question, the experts were asked to evaluate the importance of the criteria of the study process, but not asked to evaluate the quality of the study process in the universities their represent.

The systematization and analysis of the collected data using the AHP method was performed in the third part of the research measuring the compatibility of expert opinions and calculating the weights of the criteria composing the study process at the university level.

Let us recall that E_k, $k = 1, 2, ..., 16$ denotes the kth expert. In addition, D_m, $m = 1, 2, ..., 7$ and I_j, $j = 1, 2, ..., 30$ denote the mth area and the jth criterion (see Table 2) accordingly. As it is mentioned above, to make a decision on the order of the priorities of criterion I_j in areas D_m, the AHP method (Satty, 2008) is used. The point of the method is the pairwise comparison of criterion I_j that is performed by each expert E_k separately in all areas D_m. To make a comparison, experts need a scale of the numbers indicating how many times one more important or dominant criterion is over another with respect to the property they are compared.

According to the steps provided section 2.4 in Capter 2, the results and conclusions, according to the significance of the criteria listed in Table 2.3, are derived. First, the consistency of pairwise comparison matrices $P_m^{(k)}$ was tested. The

use of (2.16)–(2.18) gives the degrees of consistency $S_m^{(k)}(\%)$ (see Table 3.1) of pairwise comparison matrices.

Table 3.1. The inconsistency ratios of pairwise comparison matrices (compiled by auhor)

E_k \ $S_m^{(k)}$	$S_1^{(k)}$	$S_2^{(k)}$	$S_3^{(k)}$	$S_4^{(k)}$	$S_5^{(k)}$	$S_6^{(k)}$	$S_7^{(k)}$
E_1	7.00	7.29	7.53	9.00	1.48	6.30	8.72
E_2	6.93	8.10	9.38	8.69	7.90	7.45	8.80
E_3	1.15	9.06	7.05	8.15	2.82	6.33	9.80
E_4	7.82	8.74	8.78	6.93	2.82	2.81	6.53
E_5	9.90	8.67	6.99	8.31	7.82	6.30	8.68
E_6	9.37	~~81.53~~	~~18.18~~	~~52.49~~	7.82	9.15	~~25.49~~
E_7	6.81	~~39.78~~	~~84.69~~	~~35.30~~	~~60.16~~	0.89	~~27.54~~
E_8	7.54	9.28	9.85	8.07	4.65	0.89	9.09
E_9	8.26	6.80	9.85	8.35	0.72	7.79	8.66
E_{10}	4.44	5.91	0.63	0.63	3.72	0.89	0.63

Here, blue areas highlight such values of $S_m^{(k)}(\%)$ because rule $S_m^{(k)}(\%) \le 10\%$ is unsatisfied.

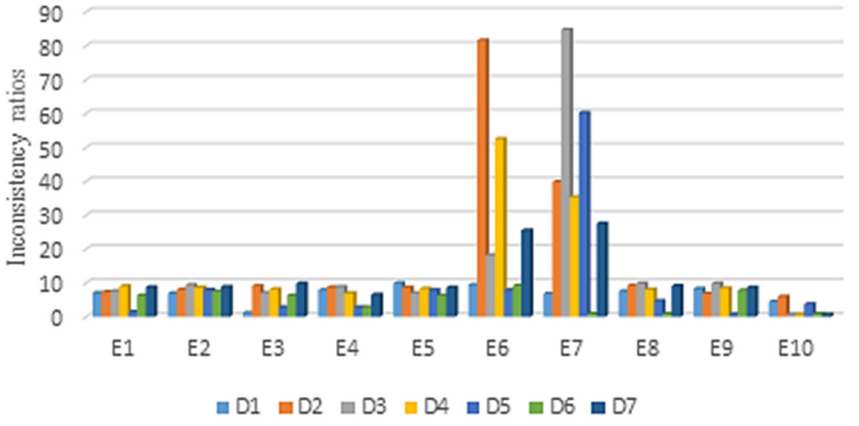

Fig. 3.1. The inconsistency ratios of pairwise comparison matrices (compiled by auhor)

First, since $S_m^{(6)}(\%) > 10\%$, $m = 2, 3, 4, 7,$ and $S_m^{(7)}(\%) > 10\%$, $m = 2, 3, 7,$ (see Table 3.1 and Fig. 2.5), pairwise comparison matrices $P_m^{(6)}$, as $m = 2, 3, 4, 7,$ and $P_m^{(7)}$, as $m = 2, 3, 4, 5, 7,$ are inconsistent. Respective pairwise comparison matrices were created by experts E_6 and E_7 in areas D_2, D_3, D_4, D_7. As mentioned in before, inconsistent pairwise comparison matrices cannot be used for further research, unless experts were asked to revise their judgments. Only pairwise comparison matrices for which $S_m^{(k)}(\%) \leq 10\%$ were selected for further decisions, i.e. the next stage of research.

Second, section 2.4 in Capter 2 shows the consistencies of expert judgments that should be performed. Thus, according to (2.19)–(2.21), the values of Z_m, W_m, χ_m^2 are calculated in every area D_m (see Table 8). Also, critical values $\chi_{\alpha,\nu}^2$ with $\nu = n - 1$ degrees of freedom and $S_{\alpha,n}$ with confidence level $\alpha = 0.05$ are selected (see Table 3.2).

Table 3.2. The consistency of expert judgments (source: personal elaboration based on DI Management Services Pty and Friedman, 1940)

	D_1, $n = 4$	D_2, $n = 5$	D_3, $n = 5$	D_4, $n = 5$	D_5, $n = 3$	D_6, $n = 3$	D_7, $n = 5$
W_m	34	53	58	25	73	25	27
χ_m^2	14.23	29.89	32.74	14.00	20.57	7.00	15.37
$\chi_{\alpha,\nu}^2$	7.82	9.49	9.49	9.49	5.99	5.99	9.49
Z_m	332	1046	1146	490	288	98	538
$S_{\alpha,n}$	101.70	183.70	183.70	183.70	48.10	48.10	183.70

Let us note, that all areas take $\chi_m^2 > \chi_{0.05;\nu}^2$, and thus, H_0 are rejected in all areas and there is no reason to discredit the consistencies of expert judgments.

The same conclusion follows if we use critical values $S_{\alpha,n}$ from the table presenting the critical values of Kendall's coefficient of concordance as in all cases $Z_m > S_{0,05,n}$.

Table 3.3. The weights and ranks of criteria assigned by experts (compiled by author)

D	E_k / I_j	E_1	E_2	E_3	E_4	E_5	E_8	E_9	E_{10}	$\bar{q}_{m,i}$	Rank
D_1	I_1	0.20	0.11	0.13	0.23	0.05	0.50	0.17	0.26	0.21	3
	I_2	0.66	0.62	0.46	0.63	0.57	0.26	0.44	0.06	0.46	1
	I_3	0.09	0.05	0.19	0.10	0.24	0.08	0.08	0.12	0.12	4
	I_4	0.05	0.22	0.22	0.04	0.14	0.16	0.31	0.56	0.21	2
D_2	I_5	0.59	0.29	0.53	0.43	0.50	0.24	0.43	0.42	0.43	1
	I_6	0.07	0.04	0.07	0.07	0.16	0.10	0.18	0.10	0.098	4
	I_7	0.04	0.06	0.03	0.04	0.03	0.04	0.15	0.21	0.07	5
	I_8	0.11	0.15	0.26	0.34	0.25	0.51	0.07	0.23	0.24	2
	I_9	0.19	0.46	0.10	0.12	0.06	0.12	0.17	0.05	0.16	3
D_3	I_{10}	0.48	0.44	0.45	0.45	0.51	0.48	0.45	0.15	0.43	1
	I_{11}	0.11	0.13	0.16	0.07	0.13	0.07	0.15	0.26	0.13	4
	I_{12}	0.32	0.09	0.26	0.30	0.08	0.26	0.04	0.44	0.22	2
	I_{13}	0.06	0.31	0.10	0.14	0.26	0.16	0.30	0.05	0.17	3
	I_{14}	0.03	0.03	0.03	0.04	0.03	0.04	0.07	0.09	0.05	5
D_4	I_{15}	0.07	0.03	0.08	0.12	0.03	0.13	0.20	0.15	0.10	5
	I_{16}	0.47	0.16	0.04	0.04	0.08	0.04	0.04	0.05	0.12	4
	I_{17}	0.25	0.26	0.26	0.57	0.50	0.44	0.52	0.26	0.38	1
	I_{18}	0.17	0.49	0.47	0.07	0.26	0.07	0.16	0.09	0.22	2
	I_{19}	0.04	0.06	0.15	0.20	0.12	0.32	0.08	0.44	0.18	3
D_5	I_{20}	0.20	0.07	0.18	0.18	0.06	0.28	0.22	0.26	0.18	2
	I_{21}	0.74	0.78	0.75	0.75	0.65	0.63	0.69	0.63	0.70	1
	I_{22}	0.06	0.15	0.07	0.07	0.29	0.09	0.09	0.11	0.12	3
D_6	I_{23}	0.07	0.23	0.19	0.27	0.28	0.25	0.55	0.30	0.27	2
	I_{24}	0.64	0.08	0.72	0.67	0.64	0.68	0.37	0.54	0.54	1
	I_{25}	0.28	0.69	0.08	0.06	0.07	0.07	0.07	0.16	0.19	3
D_7	I_{26}	0.05	0.06	0.14	0.23	0.07	0.12	0.06	0.15	0.11	3
	I_{27}	0.22	0.03	0.04	0.11	0.04	0.03	0.03	0.09	0.08	5
	I_{28}	0.51	0.23	0.26	0.56	0.51	0.51	0.27	0.44	0.41	1
	I_{29}	0.08	0.12	0.07	0.07	0.14	0.07	0.15	0.05	0.09	4
	I_{30}	0.15	0.56	0.49	0.04	0.23	0.27	0.49	0.26	0.31	2

Since expert judgments E_k, $k = 1, 2, ..., 14$ are consistent, the significance of criterion I_j, $j = 1, 2, \ldots, 30$ could be tested. Table 3.3 shows the results of the weights (2) of the jth criterion assigned by the kth expert E_k in separate areas D_m, $m = 1, 2, ..., 7$. In addition, general weights (2.22) and ranks are listed.

3.2. Comparison of Research Results in A, B and C Universities Experts

In order to achieve greater university Activities for economic sustainability and to perform a more accurate assessment of the quality assessment of the study process the next step is to identify differences between different universities.

Table 3.3 show that, depending on expert opinions, the most significant criteria in areas D_m are I_2, I_5, I_{10}, I_{17}, I_{21}, I_{24}, I_{28} accordingly. To be more precise, the judgments of all experts considering the most important criterion I_{21} are the same in area D_5. The weight of this criterion is 70,18% of the total weights of criteria I_{20}, I_{21}, I_{22}. As for area D_3, only one expert E_{10} decided that the most important criterion was I_{12} rather than I_{10}. It is interesting to notice that experts prevail infrastructure rather than human input in area D_6. In all other areas, according to the most significant criteria, only opinions 2 or 3 are different. The weights of the most significant criteria in the above mentioned areas are not less than 38% of the total weights of the criteria in the respectful areas. Criteria I_3, I_6, I_{11}, I_{16}, I_{22}, I_{25}, I_{29} are of the lowest importance.

Recall that the group of experts is composed of decision makers from A (E_k, $k = 1, 2, 3, 4$) and B (E_k, $k = 5, 6, 7, 8, 9, 10$) and C (E_k, $k = 11, 12, 13, 14, 15, 16$). Considering the consistent matrices of pairwise comparison (see Fig. 3.1), decisions on the significance of criterion I_j in areas D_m given the mentioned expert groups, are performed. Tables 3.4–3.6 exhibit the results determined following the prior steps.

Table 3.4. The consistency of the judgments of A experts (source: personal elaboration based on DI Management Services Pty and Friedman, 1940)

	D_1. $n = 4$	D_2. $n = 5$	D_3. $n = 5$	D_4. $n = 5$	D_5. $n = 3$	D_6. $n = 3$	D_7. $n = 5$
W_m	63	85	84	36	81	19	39
χ^2_m	7.50	13.6	13.40	5.80	6.50	1.50	6.20
$\chi^2_{\alpha,\nu}$	7.82	9.49	9.49	9.49	5.99	5.99	9.49
z_m	50	136	134	58	26	6	62
$S_{\alpha,n}$	49.5	88.4	88.4	88.4	–	–	88.4

Table 3.5. The consistency of the judgments of B experts (source: personal elaboration based on DI Management Services Pty and Friedman, 1940)

	D_1. $n = 4$	D_2. $n = 5$	D_3. $n = 5$	D_4. $n = 5$	D_5. $n = 3$	D_6. $n = 3$	D_7. $n = 5$
W_m	45	55	45	65	81	81	85
χ^2_m	5.40	8.80	7.20	10.40	6.50	6.50	13.60
$\chi^2_{\alpha,\nu}$	7.82	9.49	9.49	9.49	5.99	5.99	9.49
z_m	36.00	88.00	72.00	104.00	26.00	26.00	136.00
$S_{\alpha,n}$	49.50	88.40	88.40	88.40	–	–	88.40

Table 3.6. The consistency of the judgments of C experts (source: personal elaboration based on DI Management Services Pty and Friedman, 1940)

	D_1, $n = 4$	D_2, $n = 5$	D_3, $n = 5$	D_4, $n = 5$	D_5, $n = 3$	D_6, $n = 3$	D_7, $n = 5$
W_m	30	65	57	51	78	11	76
χ^2_m	5.40	15.60	13.73	12.13	9.33	1.33	18.27
$\chi^2_{\alpha,\nu}$	7.82	9.49	9.49	9.49	5.99	5.99	9.49
z_m	54	234	206	182	56	8	274
$S_{\alpha,n}$	49.5	88.4	88.4	88.4	–	–	88.4

After completion of the consistency of judgments the analysis continues by assessing general weights of criteria assigned by experts from A, B, C universities.

3.3. The General Weights of the Criteria Assigned by A, B, C University Experts

The general weights of the criteria assigned by A university experts outlined the following importance for the areas of the study process at university: D_1 – quality culture (59.25%), D_2 – learning outcomes of the study programmes (39.64%), D_3 – motivation and reflection of students (45.65%), D_4 – students progression while studying (33.46%), D_5 – importance of competent teachers (75.36%), D_6 – IT infrastructure facilities (52.84%), D_7 – information on the student satisfaction (38.83%).

The general weights of the criteria assigned by B university experts outlined the following importance for the areas of the study process at university: D_1 – quality culture (33.26%), D_2 – learning outcomes of the study programmes (39.64%), D_3 – motivation and reflection of students (39.65%), D_4 – students progression while studying (42.96%), D_5 – importance of competent teachers (65.00%), D_6 – IT instructure facilities (55.89%), D_7 – information on the student satisfaction (43.44%).

In conclusion of results obtained from the research there were no significant differences while selecting most important criteria from each of the area of the study process at university among the experts' opinions representing selected universities in Lithuania. The differences in priorities for the criteria appear only making the decision for the second or third option. For example: for the Quality assurance policy D_1 A experts emphasize the Continuous improvement I_1 criteria as the second and B experts highlighting the Stakeholders importance I_4. In the Study conditions area D_4 A experts go for successful student certification (I_{19}) while B experts put students mobility (I_{19}) as the second most important criteria. However, the differences in the majority of areas are rather minor.

The next important step in this research was to justify the identified criteria with an opionion of foreign experts. In order to expand the research and test the approach of importance of criteria that composes study process at university the experts from two higher education institutions in Finland were invited to take part in this research. 4 experts were respresented the Novia University of applied Sciences in Abo and Jacobstad and 2 experts were represented the Haaga-Helia University of Applied Sciences in Porvoo. Taking into account that single samples of respondens from name institutions was not enough to represent each university, the respondents here presented as combined sample of Finnish (C university). This part of research was performed in autumn 2018 and spring 2019 in Finland.

The general weights of the criteria assigned by A, B, C experts are provided in Fig. 3.2.–3.4

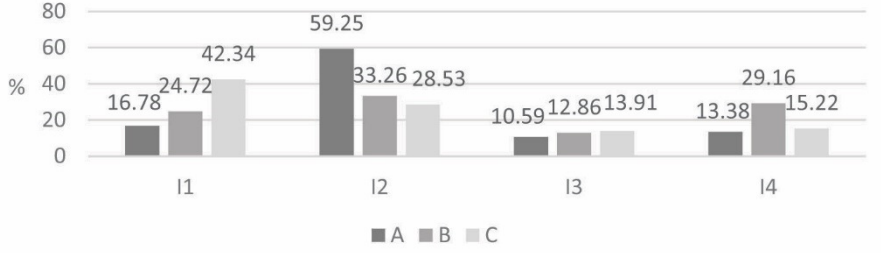

Fig. 3.2. The general weights of the criteria assigned by A, B, C university experts for quality policy (compiled by author)

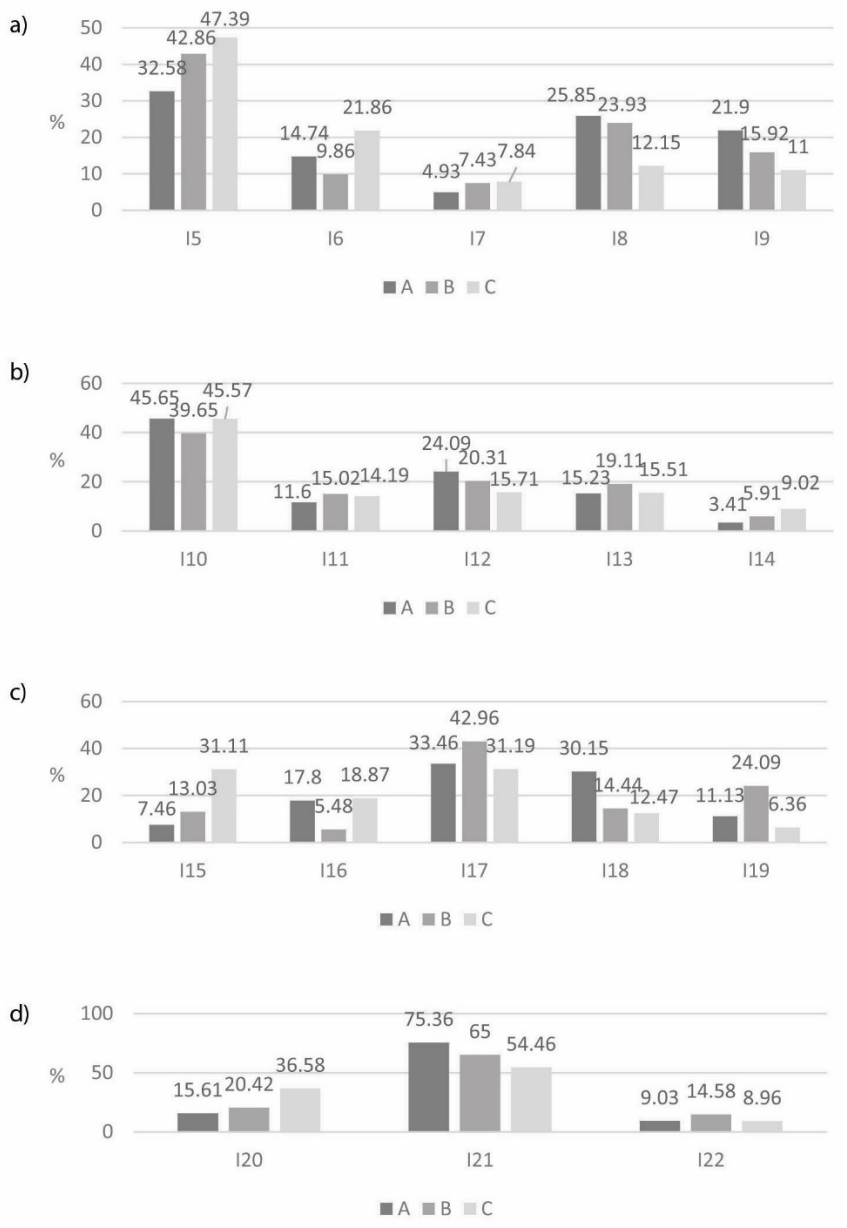

Fig. 3.3. The general weights of the criteria assigned by A, B, C university experts for: a) study programmes; b) students; c) conditions for studies; d) teachers (compiled by author)

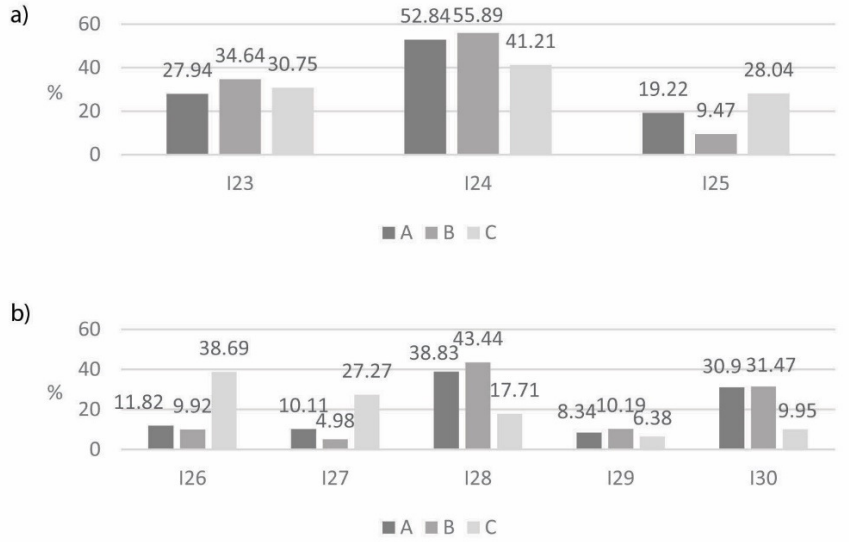

Fig. 3.4. The general weights of the criteria assigned by A, B, C university experts for: a) study resources; b) information (compiled by author)

The general weights of the criteria assigned by experts from Finland (called C experts) outlined the following importance for the areas of the study process at university: D_1 – continuous improvement (42.33%), D_2 – learning outcomes of the study programmes (47.39%), D_3 – motivation and reflection of students (45.57%), D_4 – students progression while studying (31.19%), D_5 – importance of competent teachers (54.46%), D_6 – IT instructure facilities (41.21%), D_7 – relevant indicators (38.69%).

After review of the results it is important to point out that the differencies of opinions on criteria importance from these experts were minor in comparing to experts representing the Lithuanian universities. Only 2 ares revealed the diferent importance, namely D_1 and D_7.

3.4. Selection of Economic Indicators Substantiating the Analysed Criteria

After review of research results, there is a strong will and need to continue the analysis by selecting or creating a set of economically measurable variables and indicators. Such set variables could be a useful tool for university decision-makers in order to better understanding the importance and mode of study process at the

university education level. To implement this the approach of the Balanced Scorecard methodology was in use. It is also notable that set should clearly indicate the shift in responsibilities for variables at the university (institutional) as well as at the faculty (department) levels. Full list of criteria provided in Table 3.7 on pages 91–92 of this dissertation.

One of the biggest challenges to measure in economic terms the area D_1 – Quality assurance policy. According to ESG provisions, this area was extracted into the list of 4 criteria. Let's assume that such criteria as "stakeholders" and "accountability" are quite easy to be measured numerically. In a number of cases, we can find that universities are counting numbers of signed contracts with stakeholders, i.e. business companies, governmental bodies, labour market. There is a possibility to monitor income flows to universities from state funds, fundraising, donations, contracts, provided services etc. The accountability elements itself usually requires to make a number of reports for a certain period of time. In most cases of state- fund universities there are the strict requirements to report on the activities and use of state funds while performing. Even "continuous improvement" separately could be viewed from the time perspective comparing the strategic plans of universities with their achievements or at least reports. But the "quality culture" criteria is really difficult to image transferred to a data or in a form of numbers in an excel sheet. For the operational level, to assure and develop higher education quality "quality management" as a set of management practices developed by universities should be used. Obviously the quality assurance, as the overarching concept, should refer to the goals, strategy and methodology of assuring and developing quality in higher education (Seyfried & Pohlenz, 2018) and should be measured only by correspondence to PDCA circle or similar methodology. In this line Quality Assurance policy as an area is seen as strong precondition university activities for economic sustainability but not measurable numerically. The university level indicators for this area could be a "University impact on region and society" followed by "The attractiveness of university to employers and labour market". The department level variables were not specified for this area.

For the area D_2 – Study programmes experts emphasized the "learning outcomes" as the criteria of main importance. This criterion is not measurable by using a single indicator. Moreover, implementation of learning outcomes requires an interrelation of the areas as conditions for studies, teachers, study resources. To achieve excellence in developing study programmes at the university required to set a clear objective targes for every study programme emphasizing the relations with external stakeholders and the labour market.

Criteria of "monitoring and supervision" of study programmes emphasize the need for permanent attention from university to the composition of the set of study programmes, to their targets, interrelations also to avoid content overlaps in subjects. The fulfilment of these criteria should refer to make amendments and

changes inside study programmes to keep them "one step forward" rather than monitoring of students' intake or replacement separate subjects by occasion. Obviously it requires the sufficient number of human and financial resources form university to create and empower study bodies (committees) for each of the programmes. Performing benchmarking exercise could be also a solution for universities in order to achieve the excellence and exceptionality of the set of study programmes as a core element of university maturity. Here we can conclude that if the graduates form selected study programme are welcomed at labour market they contribute to a university activities for economic sustainability.

The suggested university level indicators for this area are "The portfolio of study programmes" and "Benchmarking with the "best in class" study programmes globally". The departmental level could contribute to these variables by monitoring the "Employment rates after graduation" and "Career development and rise of incomes of graduates" indicators.

The research revealed that in the area D_3 – Students – the criteria of "students' motivation, reflection" are the highest importance. The phenomena of university attractiveness has strong correlation with student motivation factor. The challenge to admit students with highest entering scores but also highly motivated should be seen as target for university level decision making policy. On the faculty level responsibility would be to take into account making a competition among students not only at the entrance level to join the study programme but also during whole study process.

Criteria of "variety of pedagogical methods" was identified as second most important in this area. At the university level it could be seen as promotion of "Inclusive university level studies" for students. This component includes a composition of study modes, internationalisation, teaching methods and techniques that involve students in their daily operations and activities. A "development and application of Hands-On learning process" is offered as indicator at the faculty level to implement this criteria.

Area D_4 – Conditions of studies – emphasized "student progression" and "mobility" criteria. Students chooses the university but also a study programme for their education. Here the "duration and intensity of study programmes" including workload and internship tracks comes as one of priorities for the university level decision-makers. A "promotion of sustainably campus operations" is seen as overarching variable and the "range and diversity of international higher education partners" in order to correspond the mobility criteria.

For the faculty level to maintain appropriate conditions of studies "continuous monitoring of educational achievements for every student" could provide a feedback for students. This could be in a form of short personal report. Beside the semester grades an information about the numbers of attended and missed classes, participation in workshops and social activity could be presented. Comparison of

student academic achievements within the group could promote motivation for student to strive for excellence. In line with this aim the "digital access control for students" should be implemented in order to receive timely information about students' activity and performance also to clarify the results obtained and avoiding misunderstandings and unreasonable expectations from both sides.

Internationalization of studies is the next big challenge which can not be skipped in study process. The aim for study programme should be to reach "2/3 of students from the study programme to take part of their studies abroad". For this the study contracts need to include requirements for students to take part-time of their studies abroad. To obtain international experience and enhance their ability to be competitive in global labour market in a future.

Area D_5 – Teachers – emphasized the importance of "competent teachers" criteria. The aim at university level is to attract "the best teachers for the best students". From decision makers it requires significant investments in creating attractive working conditions, offering dignified salary and career tracks for academics. The digital access control for teachers could be installed for quality control purposes.

There are several options for development at departmental in order to promote teaching excellence. "The development of research and pedagogical skills" seen as continuous effort to strength pedagogical and research competencies. Taking into consideration the overall demand of research publications the "financial support for scientific publications" should be provided. Finally, the "ratio of the number of teaching subjects per teacher and competitive salary" should correlate more strongly.

Area D_6 – Study resources – emphasized importance of "IT infrastructure" criteria. This element is an investment consuming from the institutional level. On the other hand, contemporary university is unimaginable without "development of IT infrastructure at campus" as well as "smart auditoriums, "green" learning and living facilities". "Facilities equipped with renewable energy" also could help in promoting green policy for activities at the university level.

Then it comes to department level the track of "zero waste in operations management", as contribution to the university policy, should be implemented. Digitalization of education opens new spaces of reducing the usage of resources (e.g. paper consuming) in the study process.

Last area D_7 – Information – emphasized importance of information about "student satisfaction" while studying and the information about "career paths" of graduates. It provides two messages for university level. The development of "responsible approach to feedback about the study process" from both sides (teachers and students). Students provides an evaluations on teachers and subjects learned after every semester. In addition, teachers' feedback on the students' performance

could provide full picture of the reality of study process. Learning theory, applying practically approach needs more clear "career path vision through the study process".

Table 3.7. The university and faculty level indicators enhancing university activities for economic sustainability (compiled by author)

Area	Criteria	University (Institution) level indicators	Faculty (Department) level indicators
D_1 – Quality assurance policy	1.1. quality culture 1.2. stakeholders	1.1. University impact on region and society 1.2. The attractiveness of university to employers and labour market	not specified
D_2 – Study programmes	2.1. learning outcomes 2.2. monitoring and supervision	2.1. Portfolio of study programmes 2.2. Benchmarking with best in class study programmes globally	• Employment rates after graduation • Career development and rise of incomes
D_3 – Students	3.1. motivation 3.2. variety of pedagogical methods	3.1. Attract only the best students (Students with highest entering scores to be admitted to the programme) 3.2. Inclusive university studies (Composition of study modes, internationalisation, teaching methods and techniques that involves students)	• Competition among students to join the study programme • Development and application of "hands-on" learning process
D_4 – Conditions for studies	4.1. student progression 4.2. mobility	4.1. Duration and intensity of study programmes 4.2. Promotion of sustainably campus operations 4.3. Range and diversity of international higher education partners	• Digital access control for students • Continuous monitoring of educational achievements of every student • 100% of students with part-time studies abroad

End of Table 3.7

Area	Criteria	University (Institution) level indicators	Faculty (Department) level indicators
D_5 – Teachers	5. competent teachers	5.1. Best teachers for the best students (environment, salary, career) 5.2. Digital access control for teachers	• Digital access control for teachers • Development of research & pedagogical skills of teachers • The ratio of number of teaching subjects and competitive salary Financial support for scientific publications
D_6 – Study resources	6. IT infrastructure	6.1. Campus IT infrastructure development 6.2. Smart auditoriums, learning and living facilities 6.3. Facilities equipped with renewable energy	• Zero waste in operations management
D_7 – Information	7.1. student satisfaction 7.2. career paths	7.1. Responsible approach to feedback from both (teachers and students) sides 7.2. Clear career path vision through the study process (learning theory, applying practically)	• Continuous analysis of student feedback for every study subject • Development of university services for the alumni network • Donations and fundraising from the alumni

To contribute these university level indicators the faculty level should emphasize the "continuous analysis of student feedback for every study subject", also to keep connections with the graduate students the "development of services for the alumni network is mandatory" for every faculty. The continuous relationship with *Alma Mater* could enlarge the further cooperation as well as "donations and fundraising from the alumni".

The list of economic criteria that contribute to fostering university activities for economic sustainability could be prolonged further. It is also should be taken into consideration that criteria are only tools in help to decision-makers of mana-

ging the university level study process. University's aim to built a country of prosperity requires educating as many people as possible to create high added value. High economic value can only be created in an environment comprising cultural and social value. The solution to this problem lies in education, and particularly in university level study process, where graduates should make the most significant contribution to economics, social and cultural well-being.

3.5. Future Research Directions

The scientific results of Chapter 3 rise potentially interesting extensions. This chapter concludes by summarizing with at least four possible directions of future research opportunities:

1. First, the scientific gap of understanding and implementing the concept of sustainable development at the organisational level remains and waiting for further investigations.
2. Second, there is a real possibility for a deeper analysis of the already collected data from the assessed universities. Mainly by using other multi-criteria decision-making methods (e.g. AHP fuzzy numbers method, etc). Also, the proposed model for quality assurance assessment in universities could be renewed and amended in terms of criteria. Some criteria in assessing areas of the study process, especially those with technical origin could be withdrawn or replaced with other ones. The list of criteria could be extended for such areas of the study process as "Teachers" and "Study resources".
3. Third, an extension could be involving more respondents with different perspectives. The academics and teachers are seen as main contributors but also other stakeholders, like students and their parents also could take part in such research in order to validate already gained findings and provide more insights and common understanding of research object.
4. Finally, the search for appropriate tools and methods that determine the sustainable economic development of the universities could be prolonged with the search of most important criteria supported by appropriate indicators to measure the study process and ground the necessary decisions for policy-makers which would let to navigate the universities through the everyday issues as well as long term challenges.

3.6. Conclusions of Chapter 3

1. The accomplished research used the multi-criteria decision-making AHP method as a tool to evaluate the significance of the criteria that compose the university study process. In accordance with the requirements of the method and in order to achieve the validity and reliability of the research, experts, who were carefully selected from two of the largest Lithuanian universities and universities from Finland, participated in this research.
2. The research results have demonstrated the importance and weightage of the criteria that composes different areas of the university level study process. The findings indicate the criteria that are the most important for striving to achieve the highest quality of the study process at the university level. According to expert opinions, the most important criteria are the quality culture, learning outcomes, student motivation and reflection, student progression, competent teachers, IT infrastructure, and student satisfaction. It also should be noted that some of these criteria are difficult to measure quantitatively. The rest of the criteria are also important elements of the complex and diverse process.
3. The composition of these criteria based on appropriate indicators could become a score-card for university decision makers while managing the university study process. The list of economic indicators of the university and faculty level substantiating the analysed criteria that compose the university activities for economics sustainability was prepared based on the research results.
4. The research did not reveal significant differences between the opinions of Lithuanian and foreign experts on this subject.

General Conclusions

1. An analysis of the scientific literature on educational economics, human capital theory, and the concept of sustainable development implemented at universities reveals that the concept of sustainable development is more often analysed at the macro (state or region) level. Sustainable development at universities is understood to be a guiding principle for the strategic management, operational organization, and the possibility of updating study programs and their content. The concept of sustainable development formulated in the thesis is used in the micro (organization or institution) level, which had not been thoroughly analysed in scientific literature before.
2. The economic sustainability of university is influenced by the complexity of their activities and the diversity of their stakeholders as well as their network. Even though the lack of a unified concept of quality in university activities makes it difficult to examine university activities in the context of sustainable development, nevertheless, the quality assurance provisions of the Bologna Process gave direction to the development of quality assurance for economic sustainability in European universities.

3. The complexity of university activities was analysed using Ishikawa's Cause-effect diagram. On assessing the complexity of the university's activities and application of Cartesian method, original model of university economic sustainability was suggested.
4. The analysis of European standards and guidelines for quality assurance and study process was performed, while analysing the possibilities of the university's study process to influence activities of the university directed for economic sustainability. The expert survey confirmed the link between the quality of the university study process and the dimensions of sustainable development concept.
5. Assessment of the university study process influence for its eceonomic sustainability allowed designing of a comprehensive evaluation of the university study process quality model based on theoretical modelling and using the multi-criteria assessment method (AHP). It created conditions for the expert assessment of study process quality-determining areas.
6. The suitability of the developed model was determined by conducting research on the comprehensive evaluation of the quality of university study process in Lithuanian and foreign universities. According to the experts, most meaningful study process criteria in the areas of Study process are respectively: quality culture (59.25%); learning outcomes (47.39%); student motivation (45.65%); student progression (42.96%); competent teachers (75.36%); IT infrastructure (55.89%); student satisfaction (43.44%). Results of empirical research allowed proposition of a system of quantitative indicators that can contribute universities that pursue economic sustainability.

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Summary in Lithuanian

Įvadas

Problemos formulavimas

Švietimo ekonomikos moksle išplėtota žmogiškojo kapitalo teorija aukštajam mokslui priskiria išskirtinę svarbą šiuolaikinės visuomenės formavimuisi. Technologijų plėtra ir skverbtis, kintanti žinių samprata ir vaidmuo, demografiniai ir socialiniai visuomenės pokyčiai, Europos aukštojo mokslo erdvės propaguojamos nuostatos aukštajam mokslui lemia nuolat besikeičiantį universitetų vaidmenį šiuolaikiniame pasaulyje. Universitetus pagrįstai galime laikyti vienu iš seniausiai veikiančių organizacijų tipų. Universitetams siekiant ekonominio veiklos tvarumo, t. y. siekiant būti konkurencingiems ir atviriems šiandienos ir ateities iššūkiams reikia gerinti jų veiklos kokybę. Universitetų veiklos analizė yra sudėtinga dėl jų veiklos kompleksiškumo, didelės socialinių partnerių įvairovės ir skirtingų interesų, visuomenės lūkesčių ir nevienodų universiteto galimybių juos patenkinti globalizacijos diktuojamame visuomeniniame ir politiniame kontekste. Šiame kontekste išryškėja svarbus kokybės valdymo koncepcijų ir metodų vaidmuo, kaip priemonių, galinčių padėti universitetams siekti strateginių tikslų įgyvendinimo. Taigi, universitetai siekdami išlaikyti lyderystę ugdant visuomenę, kuriant žinias ir inovacijas, formuojant ateities žmogiškąjį kapitalą, privalo nuosekliai siekti savo veiklos kokybės bei ekonominio tvarumo panaudodami tiek vidinius, tiek ir išorinius šaltinius.

XX a. viduryje susiformavusi žmogiškojo kapitalo teorija papildė ekonomikos mokslą žiniomis apie darbo jėgos formavimo problemas, glaudžiai susijusias su išlaidų švietimui didinimu, bei valstybės vaidmens didinimu. Lenkų kilmės amerikiečių mokslininkas Jacobas Minceris buvo vienas iš darbo ekonomikos teorijos pradininkų, empiriškai

pagrindė žmogiškojo kapitalo teoriją. J. Mincerio nuopelnas, kad išsilavinimas ir žinios šiandien yra laikomi vienais iš svarbiausių ekonominio augimo veiksnių. Būtent žmogiškojo kapitalo ekonomikos teorija paskatino šiame darbe detaliai išnagrinėti tai, kas Jakobo Mincerio sukurtoje žmogiškojo kapitalo pajamų funkcijoje įvardijama kaip mokymosi trukmė (žymima raide S – *Years of schooling*).

Darbo aktualumas

Tvarios plėtros koncepcija mokslinėje literatūroje suprantama nevienareikšmiškai. Mokslinėje literatūroje dažniau analizuojama makro arba nacionaliniu lygmeniu, tačiau galima organizacijos plėtra besiremianti ekonominiu tvarumu. Būtent pastarasis aspektas laikytinas šio darbo pagrindine ašimi. Disertacijoje atskleidžiamas universiteto kaip organizacijos tipo veiklos kompleksiškumas, jį supančių socialinių partnerių gausa ir įvairovė bei jų ryšys su universitetu. Pagrindinis analizės dėmesys sutelktas vienam pagrindinių universiteto veiklos procesų – aukštojo mokslo studijų procesui, kaip prielaidai universitetui siekti ekonominio tvarumo. Šis procesas nalizuojamas ir modeliuojamas pasitelkiant Europos aukštajame moksle išplėtotą studijų kokybės užtikrinimo koncepciją. Ši koncepcija sudaro sąlygas išsamiai modeliuoti studijų procesą sudarančių komponentų ryšius ir svarbą siekiant užtikrinti universiteto veiklos ekonominį tvarumą bei sudaro prielaidas pasiekti strateginius universiteto tikslus.

Tyrimų objektas

Darbo tyrimų objektas – universiteto ekonominis tvarumas.

Darbo tikslas

Šio darbo tikslas yra sukurti universiteto ekonominio tvarumo modelį sudarantį prielaidas įvertinti atskirų universiteto sričių įtaką universiteto ekonominiam tvarumui.

Darbo uždaviniai

1. Atlikti švietimo ekonomikos, žmogiškojo kapitalo, tvarios plėtros koncepcijos įgyvendinimo universitetuose praktikos mokslinės literatūros analizę. Išanalizuoti universitetų veiklos kokybės valdymo ir tvarios plėtros koncepcijų sąryšius teoriniu aspektu.
2. Išanalizuoti universitetą supančių socialinių partnerių įvairovę, siekiant atskleisti universiteto veiklos kompleksiškumą, tuo pačiu sudarant prielaidas analizuoti universiteto veiklos procesus.
3. Suformuoti universiteto ekonominio tvarumo modelį panaudojant mokslinius metodus. Nustatyti universiteto ekonominio tvarumo sudedamąsias kompleksines dalis ir jas pagrįsti.

4. Suformuoti universiteto studijų proceso kokybės kompleksinio vertinimo teorinį modelį įvertinus ryšį tarp universiteto studijų proceso kokybės ir tvarios plėtros koncepcijos.
5. Parengti universiteto studijų proceso kokybės kompleksinio vertinimo algoritmą paremtą teoriniu modeliavimu panaudojant daugiakriterinio vertinimo metodus.
6. Atlikti universiteto studijų proceso kokybės kompleksinio vertinimo modelio tyrimą Lietuvos ir užsienio universitetuose ir patikrinti siūlomo modelio veiksmingumą.

Tyrimų metodika

Siekiant nustatyti tiriamojo objekto ribas bei ieškant naujų tyrimo aspektų atlikta mokslinės literatūros analizė, kurią sudaro: mokslinių koncepcijų sisteminimas, lyginamoji analizė, interpretavimas, terminologijos sugretinimas, meta analizė. Universiteto veiklos ekonominio tvarumo kompleksiškumo vertinimui panaudota Dekarto sandauga. Empirinis tyrimas atliekamas derinant kiekybinės ir kokybinės analizės metodus. Kiekybinei tyrimo daliai atlikti panaudota struktūruota ekspertų apklausa. Kokybinei tyrimo daliai atlikti panaudotas matematinio modeliavimo daugiakriterinio vertinimo metodas analitinės hierarchijos procesas (AHP), kurio pagalba Lietuvos ir užsienio šalių ekspertai atlieka studijų proceso kokybę sudarančių kriterijų porinius palyginimus, siekiant nustatyti jų įtakos procesui svarbą. Siekiant darbo tikslo taip pat panaudoti šie kokybės vadybos metodai ir koncepcijos: priežasčių–pasekmių diagrama, subalansuotų rodiklių sistema, aukštojo mokslo institucijų vidinės studijų kokybės užtikrinimo koncepcija.

Mokslinis naujumas

Rengiant disertaciją buvo gauti šie ekonomikos mokslui nauji rezultatai:

1. Atlikus universiteto veiklos ekonominio tvarumo vertinimą pagilinta ir išplėsta tvarios plėtros bei universitetų veiklos kokybės koncepcijos.
2. Sukurtas universiteto ekonominio tvarumo modelis. Nustatyta universiteto studijų proceso kokybės kriterijų įtaka universiteto ekonominiam tvarumui plėtoti. Tyrimo rezultatais remiantis pasiūlytas rodiklių rinkinys universiteto studijų proceso kokybei matuoti.
3. Sukurtas universiteto studijų proceso kokybės kompleksinio vertinimo teorinis modelis, kuris empiriškai patikrintas Lietuvos ir užsienio universitetų pavyzdžiais.
4. Pagilinta ir išplėtota ekonomikos mokslo žmogiškojo kapitalo teorija atskleidžiant žinių ir išsilavinimo reiškinių turinį, sandarą ir svarbą šiuolaikiniame universitete.

Tyrimo apribojimai

1. Tvarios plėtros koncepcija mokslinėje literatūroje daugiausiai nagrinėjama nacionaliniu arba makro lygmeniu. Šiame darbe pagrindinis dėmesys skiriamas organizaciniam arba mikro lygmeniui, kuris mokslinėje literatūroje iki šiol nagrinėtas mažiausiai.
2. Įvertinus aukštojo mokslo srities kompleksiškumą disertacijoje analizuojamas vienas iš kelių galimų aukštojo mokslo institucijų tipų, t. y. universiteto pagrindinės veiklos procesas – aukštojo mokslo studijų procesas.

Darbo rezultatų praktinė reikšmė

Sukurtas universiteto studijų proceso kokybės kompleksinio vertinimo teorinis modelis sudaro prielaidas universitetams ir kitoms aukštojo mokslo institucijoms plėtoti jų vykdomą studijų procesą ir sudaryti sąlygas, kurios padėtų efektyviai siekti strateginių universiteto tikslų įgyvendinimo. Sutelkdami dėmesį į studijų procesą sudarančius kriterijus pagrindžiančių rodiklių formavimą, jų monitoringą ir pritaikymą siekiant misijos, universitetas galėtų labiau užtikrinti savo veiklos ekonominį tvarumą.

Ginamieji teiginiai

1. Darnią ir tvarią šiuolaikinės visuomenės raidą gali užtikrinti tik tuos pačius – darnos ir tvarumo – principus savo veikloje įgyvendinantys universitetai. Organizacinis lygmuo arba institucinis aspektas turi būti laikomas lygiaverte tvarios plėtros koncepcijos dalimi kartu su ekonominiu, socialiniu ir aplinkosauginiu aspektais.
2. Vienas svarbiausių prioritetų plėtojant tvarios ekonominės socialinės raidos siekius yra kokybės vadybos priemonėmis pagrįsti universiteto vykdomas veiklas, siekiant jų veiklos veiksmingumo bei ekonominio tvarumo. Tokiu būdu universitetinės studijos tampa vienu svarbiausių universiteto veiklos procesų, kurio kokybė sąlygoja ir įtakoja kitų pagrindinių universiteto veiklos procesų (mokslo, inovacijų, III misijos) plėtojimą sąveikaujant skirtingiems socialiniams partneriams.
3. Universiteto studijų kokybės vertinimui matuoti tikslingai parinkus daugiakriterinio vertinimo metodą galimą sukurti patikimą įrankį konkretaus universiteto studijų proceso kokybės modeliavimui ir matavimui. Šiais principais vystoma studijų veikla gali prisidėti prie universiteto ekonominio tvarumo siekio įgyvendinimo.

Darbo rezultatų aprobavimas

Disertacijos tema yra parengti penki moksliniai straipsniai: vienas straipsnis paskelbtas žurnale, įtrauktame į Clarivate Analytics (Web of Science) duomenų bazę, trys – paskelbti

kitų, tarptautinių duomenų bazių moksliniuose leidiniuose, vienas – tarptautinės konferencijos pranešimų medžiagoje. Disertacijos rezultatai buvo pristatyti tarptautinėse mokslinėse konferencijose ir moksliniuose seminaruose:

1. Labanauskis, R. „Universiteto studijų proceso vertinimas AHP metodu" (angl. "Evaluation of university study process using AHP method"). Tarptautinė mokslinė konferencija *Contemporary Issues in Business, Management and Economics Engineering (CIBMEE 2019)*, 2019 m. gegužės 9–10 d., Vilnius, Lietuva.
2. Labanauskis, R. „Tvaraus universiteto bruožai. Literatūros apžvalga" (angl. *Key Features of Sustainable Universities: A Literature Review*). 10 kasmetinė mokslinė Baltijos verslo vadybos konferencija *Sustainable Organizations: Creating and Managing in Turbulent Business Environment*, 2017 m. balandžio 27–29 d., Ryga, Latvija.
3. Labanauskis, R. Šeši pranešimai moksliniuose seminaruose doktorantūros studijų studentams Verslo vadybos fakultete (po vieną kiekvienais studijų metais 2013–2019 m. studijų laikotarpyje.

Disertacijos struktūra

Disertaciją sudaro įvadas, 3 skyriai, bendrosios išvados, naudotos literatūros ir autoriaus publikacijų disertacijos tema sąrašai, santrauka lietuvių kalba. Taip pat yra 4 priedai. Darbo apimtis yra 134 puslapiai, neskaitant priedų, tekste pateikta 24 numeruotos formulės, 19 paveikslų ir 18 lentelių. Rašant disertaciją buvo panaudoti 184 mokslinės literatūros šaltiniai.

1. Universiteto ekonominio tvarumo koncepcijos teorinė analizė

Pirmame disertacijos skyriuje analizuojamos teorinės prielaidos bei priemones, kurios gali padėti universitetams siekti ekonominio tvarumo. Analizuojama mokslinė literatūra apie švietimo ekonomiką, žmogiškojo kapitalo teoriją, tvarios plėtros koncepcijos įgyvendinimą universitetų veikloje, kokybės valdymo koncepcijas aukštajame moksle. Nagrinėjama kokybės užtikrinimo koncepcija taikant Bolonijos proceso principus, universiteto veikla suinteresuotų socialinių partnerių įvairovė ir jų vaidmens vertinimas mokslinėje literatūroje.

Ekonominę švietimo reikšmę lemia jo vaidmuo šalies ekonomikoje. Ilgą laiką ekonomistai tinkamai neįvertino darbo jėgos kokybės svarbos. Augant ekonomikai, augo švietimo sistema ir išlaidos jos išlaikymui. Didėjo jo poveikis gamybos rentabilumui. Kadangi švietimo mokslas nustojo būti bendrosios ekonomikos teorijos dalimi, atsirado poreikis švietimo ekonomiką atskirti į atskirą mokslo šaką. Švietimo ekonomika, kaip tyrimų sritis, apima daug aspektų. Atskirai galima tirti kaštus ir naudą, ekonominį efektyvumą, teisingumą (pvz., socialinį). Taip pat galimi gilesni tyrimai, tokie kaip darbo rinkos segmentacija ar švietimo kokybė.

XX amžiaus viduryje susiformavo žmogiškojo kapitalo teorija, papildanti ekonomikos mokslą supratimu apie darbo jėgos formavimo problemas, glaudžiai susijusias su švietimo išlaidų didėjimu ir valstybės vaidmens didėjimu. Amerikiečių mokslininkas Jacobas Minceris eksperimentiškai įvertino išsilavinimo ir patirties įtaką atlyginimų dydžiui. Jo nuopelnas yra tas, kad išsilavinimas ir žinios šiandien yra laikomi svarbiausiais ekonomikos augimo veiksniais. Vėlesni Theodoro Schultzo ir kitų žmogiškojo kapitalo teoretikų darbai padėjo švietimo ekonomikos pagrindus. Žmogiškojo kapitalo teorija teigia, kad investicijos į žmones yra lemiamas veiksnys užtikrinant žmogaus gerovę. Į žmogiškąjį kapitalą investuotos lėšos sukuria didesnį BVP augimą nei lėšos, investuotos į materialųjį kapitalą.

Aukštojo mokslo ekonominis efektyvumas išlieka aukštas ir yra linkęs augti. Viešosios išlaidos aukštajam mokslui atsiperka daugiau, nei buvo tikėtasi. Pažymimas aukštojo mokslo indėlis į ekonominį šalies augimą; reikšminga universitetų įtaka ekonominei regionų plėtrai. Aukštojo mokslo socialinės grąžos lygis taip pat išlieka aukštas, tuo pagrindžiamos tiek viešosios, tiek ir privačios investicijos.

Išanalizavus švietimo ekonomikai ir žmogiškojo kapitalo teorijai skirtą mokslinę literatūrą, išskiriamos tokios svarbiausios nagrinėjamos sritys kaip: finansavimo modeliai ir valstybės išlaidos aukštajam mokslui; ekonomikos augimas ir poveikis darbo rinkai; investicijų grąža; karjera ir pajamos; signalinė diplomo vertė; studijų finansavimas (mokestis už mokslą); paskolos ir finansinė parama studentams.

Atlikta švietimo ekonomikos ir žmogiškojo kapitalo teorijos koncepcijų analizė pagrindžia šių teorijų reikšmę ir aktualumą šiuolaikiniams ekonominiams procesams. Intelektinis kapitalas, kaip varomoji šiuolaikinės ekonomikos jėga, yra laikomas žmogiškojo ir struktūrinio kapitalo deriniu, kuris sukuria ir puoselėja organizacijų vertę.

Tvarios plėtros ir darnaus vystymosi koncepcija išpopuliarėjo XX amžiaus antroje pusėje. Mokslinėje literatūroje dažniausiai analizuojami šie darnaus vystymosi aspektai: 1) ekologinis (biologinė įvairovė, gamtos ištekliai, tarša); 2) socialinis (skurdas, kultūra, paveldas); 3) ekonominis (efektyvumas, augimas, stabilumas). Tvarus verslo įmonės vystymasis reiškia verslo strategijos ir veiklos būdus, kurie turėtų patenkinti dabartinius įmonės poreikius ir atliepti suinteresuotųjų šalių keliamus reikalavimus, kartu saugodami, puoselėdami ir stiprindami ateityje reikalingus žmogiškuosius ir gamtos išteklius. Mokslininkai sutaria, kad darnaus vystymosi principų laikymasis suteikia ilgalaikę kryptį nuosekliai ir stabiliai organizacijos veiklai. Apibendrinant tvarios organizacijos požymius, galima išskirti tokius pagrindinius elementus kaip siekiai ir sugebėjimas valdyti pokyčius, organizacijos kultūra, gebėjimas mokytis organizacijos lygiu ir organizacijos sąveika su socialiniais suinteresuotaisiais subjektais bei supančia aplinka.

Makro lygmenyje tvarios plėtros ir darnaus vystymosi koncepcija analizuojama atsižvelgiant į jos ryšį su aukštuoju mokslu kaip sistema apskritai. Minėtos koncepcijos analizės mikro lygmenyje universitetai laikomi tam tikru, specifiniu, organizacijos tipu, veikiančiu jį supančioje aplinkoje. Būtent universitetai yra laikomi pagrindine aukštojo mokslo ekosistemos dalimi, apimančia ir sujungiančia šiuos tris sistemos elementus:

1) visų formų aukštojo mokslo studijas;

2) mokslinius tyrimus, mokslo rezultatų pritaikymą ir sklaidą, inovacijas;

3) 3-ąją universitetų misiją, apimančią universiteto prestižą visuomenėje, absolventų įgyjamą statusą, universiteto poveikį ir indėlį į regiono, valstybės ar pasaulio vystymąsi.

Mokslinėje literatūroje galima išskirti šias tris tvarios plėtros ir darnaus vystymosi koncepcijos įgyvendinimo universitetų veikloje analizės kryptis: valdymo arba strateginės priemonės universiteto plėtrai ir pokyčių valdymui; universitetų veiklos perorientavimas nuo siauros „žaliosios politikos“ įgyvendinimo ir ekologinio poveikio aplinkai mažinimo prie organizacinių gebėjimų ugdymo; universitetinių studijų turinys ir studijų programos tokiai universitetų veiklai, kuri padėtų siekti ekonomikos tvarumo.

Šias universitetų veiklos krytis galima analizuoti kompleksiškai taip pat ir atskirai kaip prielaidas arba veiksnius įtakojančius universitetų veiklą siekiant tvarios ekonomikos. Šie veiksniai padeda atskleisti aukštojo mokslo sektoriaus įvairovę ir universiteto, kaip pagrindinio šios srities veikėjo, veiklos sudėtingumą.

Kitoje šio skyriaus dalyje nagrinėjamos kokybės vadybos koncepcijos aukštajame moksle ir konkrečiai universitetų veikloje. Aukštojo mokslo kokybės samprata palaipsniui vystėsi nuo XX amžiaus antrosios pusės ir yra susijusi su sistemos transformacija iš elitinės į masinę. Vienas iš svarbiausių šio pasikeitimo veiksnių yra globaliai išaugę aukštojo mokslo mastai, t. y. augantys aukštųjų mokyklų ir studentų skaičiai.

Visuotinai pripažintų kokybės valdymo modelių įdiegimas aukštajame moksle neturėjo teigiamo poveikio, išskyrus atvejus, kad padaugėjo įrodymų, kad sistemingas organizacijos veiklos valdymas ir lygis, daro įtaką universitetų veiklos kokybei. Pažymėtina, kad nėra visuotinai pripažįstamos kokybės valdymo sampratos aukštajam mokslui. To priežastis yra susijusi su kokybės matavimu ir vertinimu, kurie pasižymi subjektyvumu, susijusiu su skirtingomis suinteresuotomis šalimis.

Apibendrinant mokslinėje literatūroje išskiriamus požiūrius į universiteto veiklos kokybę galimą išskirti šias išsamiai analizuojamas sritis: visuotinį kokybės valdymą; ISO 9001 standarto diegimą; kokybės užtikrinimą; išorinį universitetų vertinimą; universitetų reitingus; socialinių partnerių įtaką; investicijų grąžos aspektą; strateginį valdymą; lyderystės svarbą.

Išnagrinėjus skirtingas universiteto veiklos kokybės sampratas ir koncepcijas detalesnei universiteto veiklos analizei buvo pasirinkta Europos aukštojo mokslo Bolonijos procese suformuluota kokybės užtikrinimo koncepcija. Nuo pat Bolonijos proceso pradžios 1999 m. studijų kokybė buvo pabrėžiama kaip pagrindinis Europos aukštojo mokslo plėtros prioritetas. Studijų kokybės užtikrinimas laikomas svarbia akademinio profesionalumo dalimi ir pagrindiniu elementu kuriant institucinę reputaciją ir unikalumą konkurencingose vietinėje, tiek ir globalioje aplinkoje. Susisteminus aukštojo mokslo kokybės politiką skirtingose Europos šalyse, buvo priimti Europos kokybės užtikrinimo nuostatos ir gairės (ESG), skirti užtikrinti aukštojo mokslo institucijų studijų kokybę.

Tokiu būdu pirmajame Bolonijos proceso veiklos dešimtmetyje Europos aukštojo mokslo erdvėje universitetų veiklos kokybės samprata buvo suformuota kaip kokybės užtikrinimo paradigma. Kokybės užtikrinimas grindžiamas universiteto įsivertinimu ir vertinimu (Pukelis & Smetona, 2014). Aptariama, kad visuminės kokybės sampratos projektą turėtų sudaryti universitetų veiklos kokybės užtikrinimo, tobulinimo ir gerinimo elementų visuma.

Siekiant detaliau atskleisti universitetą supančią socialinę aplinką, buvo atlikta universitetą supančių suinteresuotų šalių ir socialinių partnerių analizė. Mokslinėje literatūroje universiteto veikla suinteresuotos grupės dažniausiai skirstomos į vidines ir išorines, taip pat į pirmines ir antrines. Universitetų veikla ir jos rezultatais suinteresuotos šalys ir

partneriai pasižymi savo turimų poreikių ir keliamų lūkesčių įvairove. Atsižvelgiant į tai, kad minėtųjų grupių lūkesčiai skiriasi ir dažnai nesutampa, universitetui, kaip šios „ekosistemos“ pagrindiniam veikėjui kyla sudėtingas uždavinys vykdant veiklą bei siekiant strateginių tikslų, sukurti vertę suinteresuotosioms šalims derinant jų poreikius ir lūkesčius. Darbdaviai ir verslo grupės pabrėžia ekonominį universiteto veiklos aspektą, potencialūs studentai, esamų studentų tėvai, visuomeninės organizacijos išskiria socialinį aspektą, dėstytojai, mokslininkai ir tyrėjai labiau akcentuoja aukštojo mokslo studijų procesą (pvz. studijų turinį, studijų programas).

Suinteresuotųjų šalių analizė pagrindžia, kad universitetas veikia tinklaveikos sąlygomis bei parodo pasikeitusią ir išplėtusią universitetų misiją, kuri nebeapsiriboja studijų ir mokslinių tyrimų vykdymu, bet skatina ieškoti naujų būdų ir priemonių partnerystei su jį supančia aplinka. Suinteresuotosios šalys veikia kaip partneriai, rėmėjai, turinio kūrėjai ir pokyčių agentai. Pateiktas paveikslas sudaro sąlygas įvardyti suinteresuotąsias šalis, dalyvaujančias universiteto veikloje, ir įvertinti jų galimą poveikį bei įtaką universitetui.

Apibendrinant atliktą švietimo ekonomikos, žmogiškojo kapitalo teorijos, darnaus ir tvaraus vystymosi koncepcijos tematikų mokslinės literatūros analizę daroma prielaida, kad universitetų ekonominis tvarumas gali reikšmingai prisidėti prie tvarios ekonomikos plėtros regiono, šalies ar globaliu mastu.

Išanalizavus mokslinę literatūrą buvo nustatyta, kad sisteminiame arba makro lygmenyje tvarios plėtros ir darnaus vystymosi koncepcija universiteto veikloje daugiausiai nagrinėjama integruotai, kompleksiškai. Organizacijos arba mikro lygmenyje tvarios plėtros ir darnaus vystymosi koncepcijos, kaip strateginių gairių ir pokyčių valdymo priemonių, plėtojimas pasižymi nuomonių ir krypčių įvairove. Išskirtos trys šios koncepcijos įgyvendinimo kryptys universitetų veikloje: valdymo arba strateginės priemonės, ekologinio poveikio aplinkai mažinimas, universitetinių studijų turinys ir studijų programos. Koncepcija sudaro sąlygas visapusiškai paruošti universitetą nuolatiniams pokyčiams ir pabrėžia mokymosi svarbą norint valdyti šiuos pokyčius.

Mokslinėje literatūroje plačiai nagrinėjami įvairūs kokybės valdymo universitetų veikloje aspektai atskleidė, kad aukštajame moksle nėra sukurto vieningo kokybės apibrėžimo, galimos įvairios jos interpretacijos ir sampratos, tačiau, Bolonijos procese sukurtos Europos nuostatos ir gairės vidiniam studijų kokybės užtikrinimui suteikė kryptį universitetams plėtojant aukštojo mokslo studijas.

Universitetą supančių suinteresuotųjų šalių ir socialinių partnerių įvairovė ir jų ryšiai su universitetu iš dalies paaiškina, kodėl iki šiol nėra sukurtos visuotinai pripažintos universitetų veiklos kokybės sampratos ir kartu pradeda atskleisti universiteto veiklos sudėtingumą ir kompleksiškumą.

Atlikta literatūros analizė sudaro sąlygas suformuluoti disertacijos uždavinius siekiant išanalizuoti universiteto ekonominį tvarumą ir veiklos kompleksiškumą, pagrįsti jį matematiniais metodais ir detaliau nagrinėti bei modeliuoti universiteto veiklą siekiant nustatyti kaip ji gali prisidėti prie ekonomikos tvarumo.

2. Universiteto ekonominio tvarumo teorinis modeliavimas

Antrame disertacijos skyriuje atliekamas universiteto veiklos kompleksinis vertinimas bei studijų proceso kokybės kompleksinio vertinimo teorinis modeliavimas. Siekiama kiekybiškai nustatyti studijų proceso kokybę sudarančių kriterijų sąsajas su tvarios plėtros koncepcijos dalimis. Atliekamas daugiakirterinio vertinimo metodų tinkamumo studijų proceso kokybei matuoti vertinimas. Pateikiamos antrojo skyriaus išvados.

Siekiant atskleisti universiteto ekonominį tvarumą antroje darbo dalyje detaliai atskleidžiamas universiteto veiklos kompleksiškumas. Šiam uždaviniui atlikti buvo pasitelkta japonų mokslininko K. Ishikawa sukurta priežasčių–pasekmių diagramos logika (S2.1 pav.).

Universiteto veiklose buvo išskirtos tokios sritys kaip aukštojo mokslo studijos, moksliniai tyrimai, valdymas, pastatai ir infrastruktūra, komunikacija, aplinka. Įvardinti kiekvieną sritį sudarantys elementai bei parengta šias sritis ir jų komponentus apjungianti diagrama universiteto veiklos kompleksiškumui pagrįsti. Visos universiteto veiklą sudarančios sritys veikdamos kartu sudaro sąlygas universiteto tvarumui, t. y. jo veiklos efektyvumui bei stabiliems finansiniams rezultatams. Detaliai aptartam universiteto veiklos kompleksiškumo ekonominio tvarumo vertinimui buvo pasitelkta Dekarto sandauga. Remiantis Kuratowskio pateiktu apbrėžimu Dekarto sandauga yra aibė visų įmanomų porų, kur pirmas elementas imamas iš pirmos aibė, o antras iš antros. Aibių X ir Y sandauga žymima $X \times Y$ (S2.1 lentelė).

S2.1 lentelė. Universiteto veiklą sudarančių sričių aibės ir jų aprašymai (sudaryta autoriaus)

Veiklos sritis (elementų aibė)	Aprašymas
$SP^{Uk}{}_{\Delta tj} = *\{SP^{Uk}{}_{i,\Delta tj}\}$	Studijų proceso aibė
$R\&D^{Uk}{}_{\Delta tj} = *\{R\&D^{Uk}{}_{i,\Delta tj}\}$	Mokslinių tyrimų ir inovacijų procesų aibė
$M^{Uk}{}_{\Delta tj} = *\{M^{Uk}{}_{i,\Delta tj}\}$	Valdymo proceso aibė
$C^{Uk}{}_{\Delta tj} = *\{C^{Uk}{}_{i,\Delta tj}\}$	Komunikacijos proceso aibė
$B\&I^{Uk}{}_{\Delta tj} = *\{B\&I^{Uk}{}_{i,\Delta tj}\}$	Pastatų ir infrastruktūros aibė
$E^{Uk}{}_{\Delta tj} = *\{E^{Uk}{}_{i,\Delta tj}\}$	Aplinkos aibė

Diagramoje pateiktos ir detaliai aprašytos universiteto veiklos sritys išreikštos aibėmis, kurios pateiktos S2.1 lentelėje. Universiteto veiklas (aibių sandaugas) siekiant ekonominio tvarumo galima išreikšti tokia tikslo funkcija:

$$\mathrm{SPE}^{\mathrm{Uk}}{}_{\Delta \mathrm{tj}} \rightarrow \mathrm{SD}^{\mathrm{Uk}}{}_{\Delta \mathrm{tj}}. \qquad \text{(S2.1)}$$

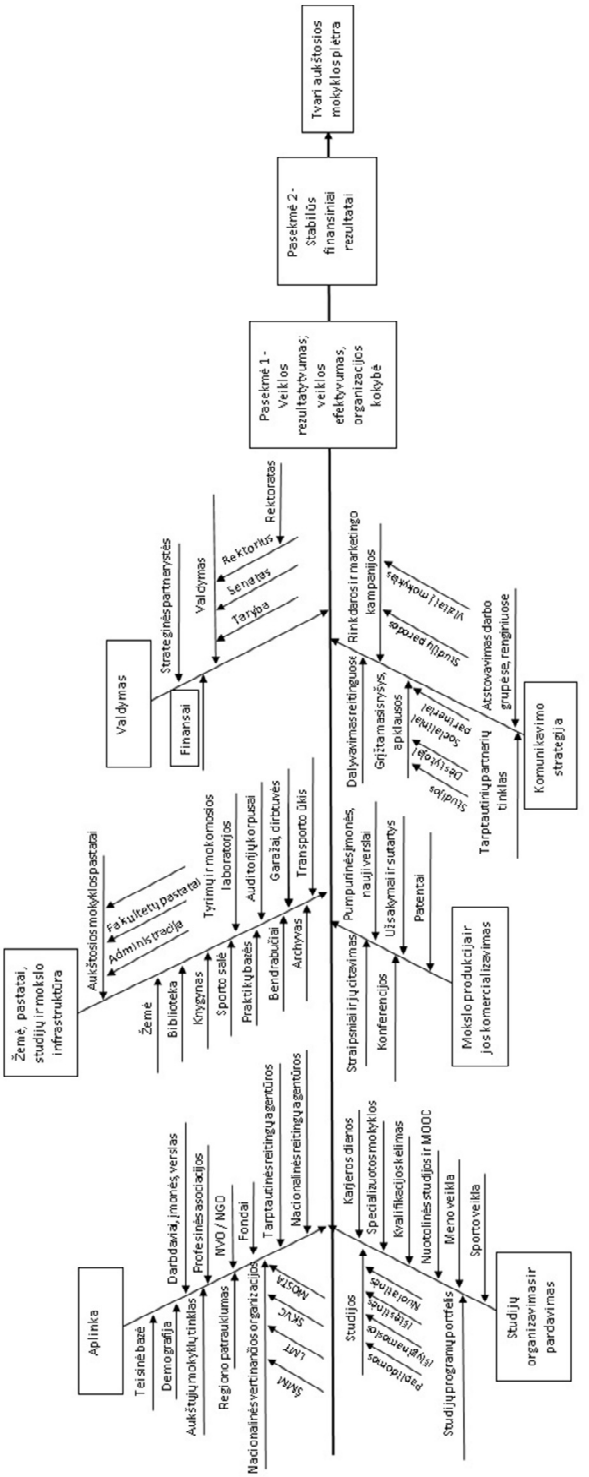
Iš šios lygties galimi du tarpusavyje susiję rezultatai: (1) organizacijos efektyvumas ir veiksmingumas ir (2) stabilūs finansiniai rezultatai. Šie rezultatai orientuoja universiteto veiklą ekonominio tvarumo linkme.

Atlikus norminių teisės aktų, kuriais valstybės lėšos skiriamos universitetams bei išanalizavus pasirinkto universiteto veikiančios Lietuvoje kelerių metų veiklos ataskaitas

buvo nustatyta, kad 2013–2018 m. laikotarpiu didžiąją dalį gautų valstybės biudžeto asignavimų sudarė lėšos, skirtos aukštojo mokslo studijoms. Konkretaus universiteto aukštojo mokslo studijų vykdymui buvo skirta apie 7 kartus daugiau lėšų nei mokslinių tyrimų ir plėtros sričiai. Disertacijoje pateikiamos studijų procesą sudarančių elementų pajamų ir išlaidų sritys, bei nurodomas jų poveikis studijų proceso aibei. Remiantis atlikta analize ir įžvalgomis tolesnė universiteto veiklos tyrimas fokusuojamas į studijų procesą.

Tuo tikslu buvo atlikta ESG studijų kokybės užtikrinimo turinio analizė siekiant įvertinti jų panaudojimo studijų procesui tobulinti tinkamumą. Buvo nustatyta, kad siekiant išsamiai analizuoti studijų procesą, kaip ekonominę universitetų veiklos tvarumo užtikrinimo sąlygą, reikalinga įvertinti šio proceso septynias sudedamąsias dalis: kokybės politikos užtikrinimą, studijų programas, studentus, dėstytojus, studijų išteklius, studijų sąlygas ir informaciją. Kiekvienoje iš nurodytų dalių buvo suformuluoti jas sudarantys kriterijai ir siekiama nustatyti ryšį studijų proceso kokybės užtikrinimo ir tvarios plėtros koncepcija. Parengtas klausimynas buvo išsiųstas didžiausių Lietuvos, bei užsienio (Estija, Suomija) universitetų atstovams, turintiems mokslo daktaro laipsnį, akademinio, administracinio arba ir akademinio, ir administracinio darbo aukštojoje mokykloje patirties. Ekspertų apklausos rezultatai patvirtino studijų procesą sudarančių kriterijų ryšį su darnaus vystymosi ir tvarios plėtros koncepcijos dalimis. Atskirai analizuojant universitetų veiklos ekonominiam aspektui buvo gauti šie rezultatai. Kokybės užtikrinimo politikos kriterijų grupėje ekspertai išskyrė atskaitomybės (75,76 proc.) ir nuolatinio tobulinimo (74,29 proc.) kriterijus. Studijų procesą sudarančio Studijų programų ir Studentų grupes sudarantys kriterijai, surinko apytiksliai panašų pasirinkimų skaičių, t. y. pusė apklaustų ekspertų nurodo, kad visi šiai grupei priskirti kriterijai gali būti susiję su darnaus vystymosi ekonomine dimensija. Studijų sąlygas sudarantys kriterijai ekspertų nuomonę nėra vienodai svarbūs, dalis jų yra labiau susiję ir atspindi ekonominę universiteto veiklos dimensiją. Šioje grupėje buvo išskirti tokie kriterijai kaip: studijų baigimas (75,76 proc.), priėmimo į studijas sąlygos (72,73 proc.) ir studentų mobilumas (69,70 proc.). Analizuojant Dėstytojų grupę sudarančius kriterijus, ekspertų pasirinkimai patvirtino, kad visi trys kriterijai yra susiję su tvaraus vystymosi ekonomine dimensija: skaidrus įdarbinimas (78,79 proc.), tinkamas mokymo personalas (72,73 proc.) ir tinkama studijų aplinka (68,75 proc.). Studijų išteklių grupėje ekspertai išskyrė IT infrastruktūros (79,41 proc.) ir bibliotekos (73,53 proc.) kriterijų svarbą. Studijų proceso Informacijos kriterijų grupėje, ekspertai išskyrė karjeros galimybes (82,35 proc.), savalaikius duomenis (74,29 proc.) ir studijų nutraukimą (67,65 proc.) kaip svarbiausius kriterijus universiteto veiklai ekonominiam tvarumui siekti.

Mokslinių šaltinių analizė atskleidė, kad sprendimų priėmimo metodai yra plačia taikomi ekonominių reiškinių tyrimams ir analizei. Pirminė universiteto veiklos studijų proceso sąryšių su darbaus vystymosi ir tvarios plėtros koncepcija analizė suponavo detalesnio šio proceso tyrimo poreikį. Šiam uždaviniui įgyvendinti buvo atlikta daugiakriterinių vertinimo metodų tinkamumo studijų proceso kokybei matuoti analizė ir pasirinktas Saaty (1980) sukurtas analitinės hierarchijos proceso (AHP) metodas. Šis metodas apima vertinimo kriterijų hierarchijos nustatymą, santykinio svorio priskyrimą apibrėžtiems kriterijams, kiekvieno kriterijaus palyginimą ir visų alternatyvų suvestinių įvertinimų sudarymą. AHP metodas pateikia struktūrizuotą sprendimų priėmimo metodą, pagrįstą hierarchiniu požiūriu į sprendimų porų palyginimo alternatyvas.



S2.1 pav. Priežasčių–pasekmių (Žuvies kaulo) diagramos modelis, skirtas analizuoti universiteto veiklos kompleksiškumą. Sudaryta autoriaus remiantis Ishikawa, 1990

Taikant šį metodą universiteto veiklos studijų procesas buvo suskirstytas į 7 grupes, D_m, m = 1, 2, ...,7, kurių kiekvieną sudarė nuo 3 iki 5 kriterijų.

AHP metodo taikymo tyrimo rezultatams apskaičiuoti seka pateikiama S.2.2 lentelėje.

S2.2 lentelė. AHP metodo taikymo studijų procesą sudarančių kriterijų reikšmingumui nustatyti (sudaryta autoriaus)

Tyrimo seka	Aprašymas
$P = \begin{bmatrix} p_{11} & p_{12} & \cdots & p_{1n} \\ p_{21} & p_{22} & \cdots & p_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ p_{n1} & p_{n2} & p_{n3} & p_{nn} \end{bmatrix}$	1. Poromis buvo palyginta n rodiklių ir nustatytos jų skaitinės prioritetiškumo reikšmės. Porinio palyginimo lentelės rezultatai pateikti matricoje P. 2. Matricos B eilučių elementų aritmetinis vidurkis duoda atitinkamų rodiklių reikšmingumo reikšmes, pagal vieno eksperto porinio palyginimo matricą.
$q_j = \frac{1}{n}\sum_{j=1}^{n} b_{ij},\ (i, j = 1, 2,\ \ldots,\ n)$	3. Rodiklių reikšmingumus gautus pagal formules naudoti tolimesniuose skaičiavimuose, jeigu porinio palyginimo matricos P suderinamumas yra pakankamas, t. y. matricos P elementai tenkina tranzityvumo sąlygą.
$(\mathrm{A} > \mathrm{B}) \wedge (\mathrm{B} > \mathrm{C}) - (\mathrm{A} > \mathrm{C})$	4. Suderinamumo tikrinimas aprašytas matricinės algebros eilute.
$S_I = \frac{\lambda_{max} - n}{n - 1}$	5. Kai matricos P tikrinė reikšmė λ_{max} apskaičiuota, skaičiuojamas matricos P suderinamumo indeksas S_I, pagal formulę.
$S = \frac{S_I}{S_A}$	6. Matrica P laikoma suderinta jeigu jos suderinamumo indekso reikšmė S <= 0,1. Idealiu atveju S = 0. 7. S_A reikšmės paimtos iš Saaty suderinamumo indekso, priklausantis nuo kriterijų (alternatyvų) kieko.
$W_m = \frac{12Z_m}{m^2(n^3 - n)}$	8. Siekiant nustatyti ar skirtingų ekspertų nuomonės yra tarpusavyje suderintos, t. y. koreliuoja, taikytas W_m kendalo konkordacijos koeficientas.
$\overline{\chi}_m^{\,2} = W_m m(n-1) = \frac{12Z_m}{mn(n+1)}$	9. Pastebėtina, kad daugumoje mokslinių straipsnių remiamasi chi-kvadrat kriterijumi, tuo atveju jei n >7, nes atsitiktinis dydis Zm turi chi-kvardrat skirstinį su n-1 laisvės laipsniu. 10. Čia Z_{m} efektyvumo rodiklių rangų sumų nuokrypių, nuo bendro rangų vidurkio, kvadratų suma

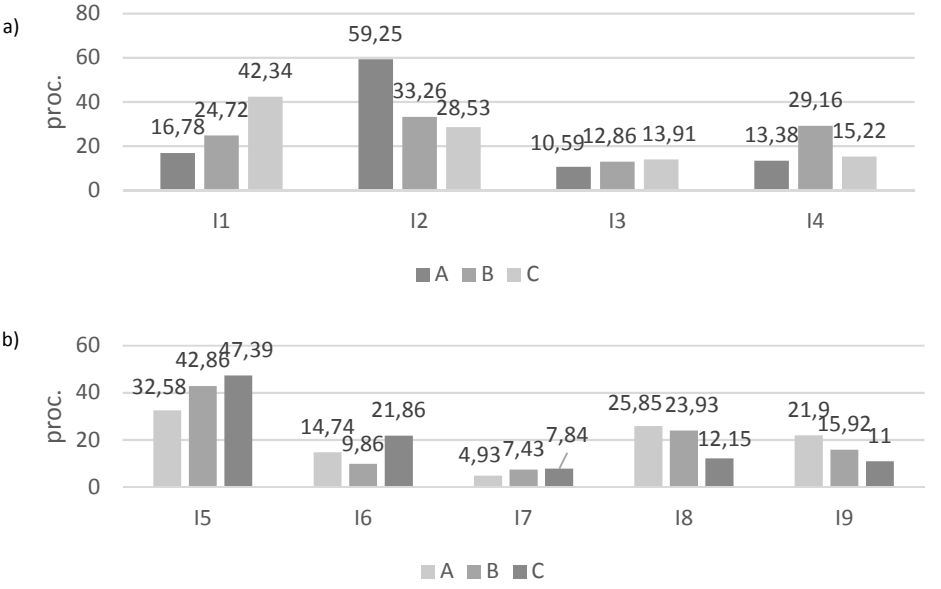
Kriterijai I_j, j = 1, 2, ..., 30, kiekvienoje grupėje buvo lyginami poromis, siekiant įvertinti jų reikšmingumą ir įtaką studijų procesui, kaip ekonominio universitetų veiklos tvarumo užtikrinimo elementui.

Tyrime dalyvavo E_k, k = 1, 2, ..., 16 ekspertų iš dviejų Lietuvos universitetų (A ir B universitetai) bei Suomijos universitetų (C universitetas). Ekspertų apklausos buvo vykdomos Lietuvoje ir Suomijoje 2018–2019 m.

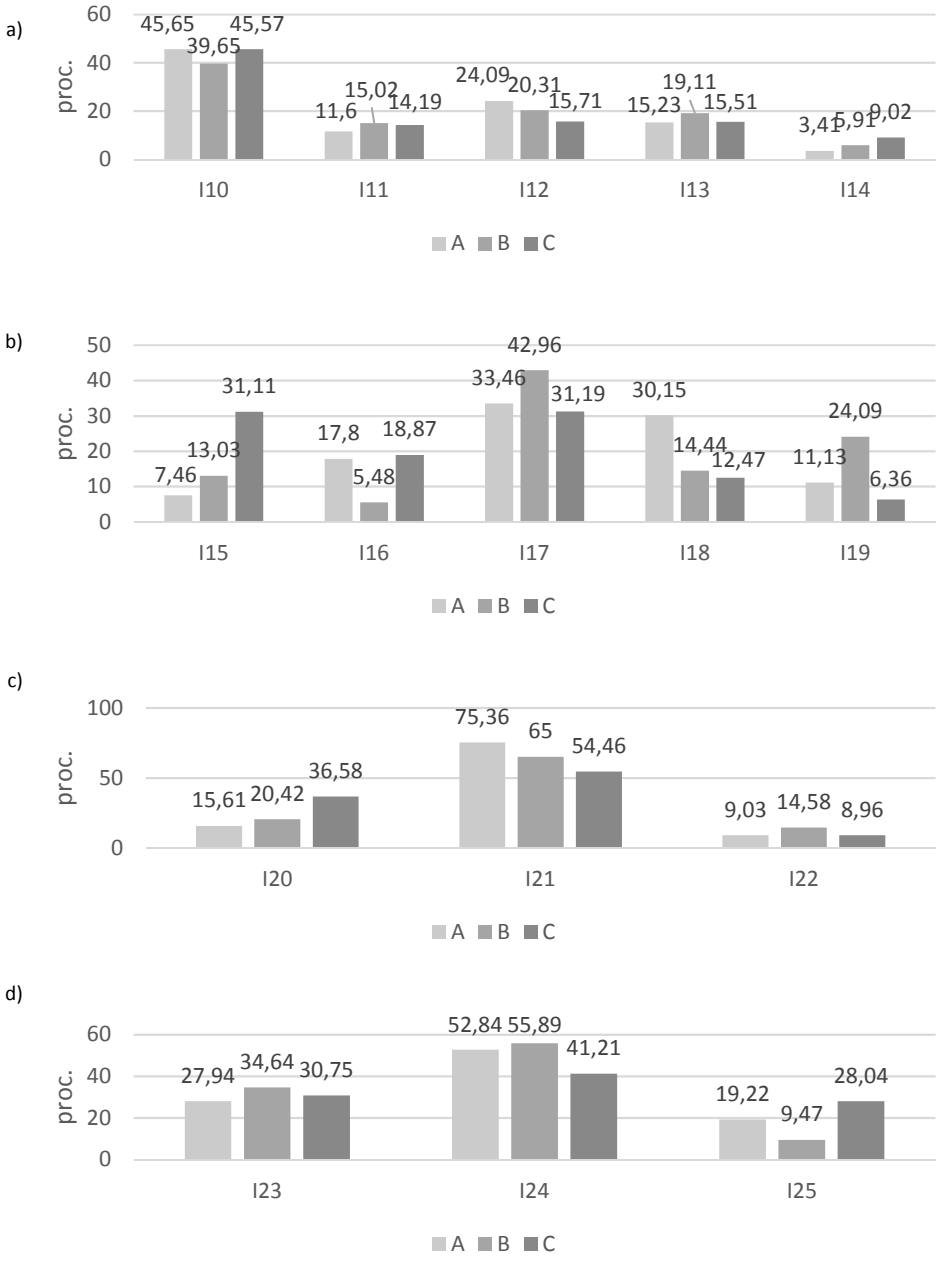
3. Studijų proceso reikšmės universiteto veiklos ekonominiam tvarumui empirinis tyrimas

Trečiame disertacijos skyriuje atliktas studijų proceso kokybės kriterijų empirinis tyrimas dviejuose Lietuvos ir vienname Suomijos universitete. Tyrime dalyvavusių ekspertų grupę sudarė atstovai iš A universiteto (E_k, k = 1, 2, 3, 4), B universiteto (E_k, k = 5, 6, 7, 8, 9, 10) ir C universiteto (E_k, k = 11, 12, 13, 14, 15, 16). A ir B yra Lietuvoje veikiantys universitetai, C – universitetų, vykdančių veiklą Suomijoje, atstovai. Analizuojant apibendrintus rezultatus ekspertų nuomone reikšmingiausi studijų proceso kriterijai D_m srityse yra atitinkamai I_2, I_5, I_{10}, I_{17}, I_{21}, I_{24}, I_{28}. Visų universitetų atstovai svarbiausiu kriterijumi nurodė I_{21} kriterijų iš D_5 grupės. Šio kriterijaus, žyminčio, kad siekiant studijų proceso tikslų ypatingai svarbus vaidmuo tenka tinkamai paruoštiems ir dirbantiems dėstytojams, svoris sudaro net 70,18 proc. tarp visų I_{20}, I_{21}, I_{22} grupės kriterijų. D_3 grupje ekspertai išskyrė I_{10} kriterijaus svarbą, kuri žymi studentų motyvaciją. Ekspertai kriterijams I_3, I_6, I_{11}, I_{16}, I_{22}, I_{25}, I_{29} skyrė žemesnę svarbą.

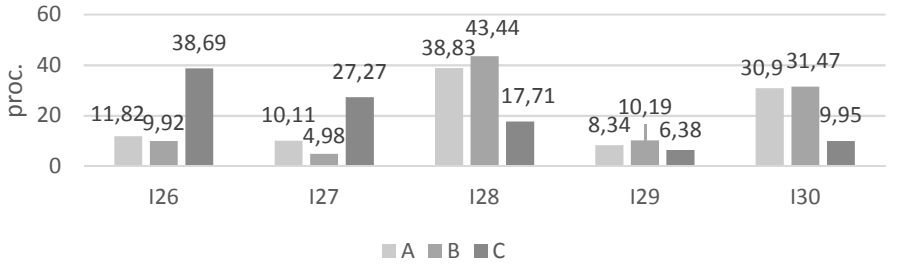
Apibendrinti universiteto studijų proceso kompleksinio vertinimo A, B ir C universitetuose pagal sritis rezultatai pateikiami S3.1–S3.3 paveiksluose.



S3.1 pav. Apibendrinti studijų proceso kompleksinio vertinimo A, B ir C universitetuose kriterijų svoriai pagal sritis: a) kokybės užtikrinimo politika; b) studijų programos



S3.2 pav. Apibendrinti studijų proceso kompleksinio vertinimo A, B ir C universitetuose kriterijų svoriai pagal sritis: a) studentai; b) studijų sąlygos; c) dėstyojai; d) studijų ištekliai



S3.3 pav. Apibendrinti studijų proceso kompleksinio vertinimo A, B ir C universitetuose kriterijų svoriai pagal sritis: informacija

Atlikto tyrimo rezultatai įvardijo ekspertų nuomone svarbiausius universiteto studijų proceso kriterijus. Šiems kriterijams matuoti buvo pasiūlytas rodiklių rinkinys, kuris remiasi subalansuotų rodiklių sistemos metodikos principais. Pasiūlytą rodiklių rinkinį galima vertinti kaip intelektinio kapitalo įrankį, kuris gali būti naudingas universiteto vadovybei priimant sprendimus tobulinant universiteto studijų procesą, siekiant jo ekonominio tvarumo.

Kokybės užtikrinimo (D_1) srityje ekspertai svarbiausiais išskyrė kokybės kultūros ir tęstinio tobulinimo kriterijus. Darytina prielaida, kad šią sritį tikslingiau vertinti universiteto lygmenyje formuojant universiteto poveikio regionui ir visuomenei bei universiteto patrauklumo darbdaviams ir darbo rinkai rodiklius.

Studijų programų (D_2) srityje daugiausiai dėmesio sulaukė studijų siekinių ir programų stebėsenos kriterijai. Šiuos kriterijus vertinant universiteto lygiu būtų tikslinga stebėti studijų programų portfelio sandarą, vykdant sugretinimo analizę su geriausiomis programomis atskirose kryptyse globaliu mastu.

Studentų (D_3) srityje buvo akcentuojama motyvacija bei pedagoginių metodų taikymo įvairovė. Pirmasis kriterijus nurodo universitetams kryptį į studijas pritraukti tik geriausiai joms pasirengusius kandidatus. Antrasis – modeliuoti įtraukų studijų procesą derinantį skirtingus dėstymo metodus ir mokymosi būdus, pasitelkiant tarptautiškumo teikiamas galimybes.

Studijų sąlygų (D_4) srityje svarbiausiais buvo įvardinti studentų pasiekimų stebėjimas studijų metu bei tarptautinio mobilumo kriterijai, kurie susiję su stidjų programų trukmės ir intensyvumo bei tvaraus univerisiteto miestelio kūrimo klausimais.

Dėstytojų (D_5) srityje ypatingo dėmesio sulaukė kompetencijos ir pasiruošimo šiam darbui kriterijus, studijų išėklių (D_6) srityje – IT infrastruktūros plėtojimo kriterijus, informacijos (D_7) srityje išsiskyrė studentų pasitenkinimo studijų procesu bei karejors galimybių kriterijai.

Tyrimo rezultatų pagrindu atliktas kiekybinių rodiklių rinkinio universiteto studijų proceso kokybei matuoti universiteto ir fakulteto lygmenyse formavimas ir pagrindimas taip sudarant prielaidas universitetui siekti ekonominio tvarumo.

Bendrosios išvados

1. Atlikus žmogiškojo kapitalo teorijos, švietimo ekonomikos, tvarios plėtros koncepcijos įgyvendinimo aukštajame moksle praktikos mokslinės literatūros analizę nustatyta, kad tvarios plėtros koncepcija mokslo darbuose dažniausiai analizuojama makro, t. y. valstybės arba regiono lygmenyse. Tvari plėtra universitetuose suprantama kaip gairės strateginiam valdymui, operaciniam veiklos organizavimui bei aukštojo mokslo turinio ir studijų programų atnaujinimo gairės. Darbe suformuluota mikro, t. y. universiteto (organizacijos, institucijos) lygmens tvarios plėtros samprata, kuri iki šiol mokslo darbuose mažai nagrinėta.
2. Universitetų ekonominį tvarumą įtakoja disertacijoje atskleistas jų veiklos kompleksiškumas bei universitetus supančių socialinių dalininkų įvairovė ir ryšiai. Nors vieningos kokybės sampratos universitetų veikloje nebuvimas apsunkina universiteto veiklos nagrinėjimą tvarios visuomenės plėtros kontekste, tačiau Bolonijos procese įtvirtintos kokybės užtikrinimo nuostatos suteikia kryptį Europos universitetams plėtojant jų veiklos kokybės užtikrinimą siekiant ekonominio tvarumo.
3. Remiantis K. Ishikawos priežasčių–pasekmių diagramos logika išanalizuotas ir atskleistas universiteto veiklos kompleksiškumas. Įvertinus universiteto veiklos kompleksiškumą ir panaudojus Dekarto sandaugos metodą sukurtas originalus universiteto ekonominio tvarumo modelis.
4. Analizuojant universiteto studijų proceso galimybes įtakoti universitetų veiklą siekiant ekonominio tvarumo buvo atlikta Europos nuostatų ir gairių kokybės užtikrinimui studijų proceso kokybei tobulinti panaudojimo analizė. Ekspertinės apklausos būdu atliktas tyrimas patvirtino tiesioginį ryšį tarp universiteto tvarios plėtros koncepcijos ir studijų proceso kokybės dimensijų.
5. Įvertinus universiteto studijų proceso įtaką jo veiklos ekonominiam tvarumui, parengtas universiteto studijų proceso kokybės kompleksinio vertinimo modelis paremtas teoriniu modeliavimu panaudojant daugiakriterinio vertinimo metodą (AHP) sudarė sąlygas atlikti studijų proceso kokybę lemiančių sričių ekspertinį vertinimą.
6. Sukurto universiteto studijų proceso kokybės kompleksinio vertinimo modelio tinkamumas įvertintas atlikus universiteto studijų proceso kokybės kompleksinio vertinimo tyrimą Lietuvos ir užsienio universitetuose. Ekspertų nuomone reikšmingiausi studijų proceso kriterijai analizuotose srityse atitinkamai yra šie: kokybės kultūra (59,25 proc.), studijų siekiniai (47,39 proc.), studentų motyvacija (45,65 proc.), studijų eiga (42,96 proc.), kompetentingi dėstytojai (75,36 proc.), IT infrastruktūra (55,89 proc.), studentų pasitenkinimas studijomis (43,44 proc.). Tyrimo rezultatų pagrindu pasiūlytas kriterijus kiekybiškai matuojančių rodiklių rinkinys, galintis padėti universitetams siekti ekonominio tvarumo.

Annexes[1]

Annex A. Template of Experts Questionnaire
Annex B. Declaration of Academic Integrity
Annex C. The Coauthors' Agreements to Present Publications Material in the Dissertation
Annex D. Copies of Scientific Publications by the Author on the Topic of the Dissertation

[1]The annexes are supplied in the enclosed compact disc.

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MODELLING OF UNIVERSITY ECONOMIC SUSTAINABILITY

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Economics (S 004)

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Daktaro disertacija

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